REPORT

CITY OF NEW BEDFORD

LOCAL MULTI-HAZARD MITIGATION PLAN

Prepared For:

City of New Bedford, Massachusetts

January 2015

Prepared by:

CDM Smith

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Section 1
Introduction

1.1 Introduction and Purpose

New Bedford is a City that was built based on a relationship with the sea. In the 19th century, New Bedford was the whaling capital of the world. With the decline of whaling, the City became a textile center and in the past fifty years the manufacturing decline has meant yet another realignment of the City's industrial and commercial activity. The City remains a vital place and acts as a regional job center with a growing tourist and retail focus due in part to the establishment of the New Bedford Whaling National Historical Park district, which is situated adjacent to a dynamic working waterfront. New Bedford continues to rank as the top commercial fishing port in the nation in value of landed catch. In addition, the port is a growing destination for recreational boating and small cruise ships and is poised to become the working hub for our nation's entry into the offshore wind industry. A thriving arts community has also helped to transform the central district into a cultural hub for the region. This coastal urbanized area is subject to typical New England weather. Each season presents its own challenge: heavy spring rains, summer droughts, early fall hurricanes, and winter snowstorms. The intersection of these natural hazards with a man-made environment that centers on water can transform these routine events into natural disasters.

This Local Multi-Hazard Mitigation Plan (Plan) examines the natural hazards facing the City, assesses the vulnerability of the area's residents, property and businesses, and makes recommendations on ways to mitigate the negative effects of typical natural hazards. The effort has drawn from the local knowledge of a group of officials and residents, and the recommendations presented are meant to be realistic and effective steps for mitigating natural hazards. Ultimately, it is hoped that these actions will translate into savings, fewer lives lost, less property destroyed, and minimal disruption to essential services.

1.2 Development of the Plan

In September 2004, the Mayor of New Bedford appointed a local Pre-Disaster Mitigation Planning Committee and charged them with the development of this Plan. The group was diverse, covering a wide range of disciplines and areas including; planning, public safety, health, human services, port authority, public facilities and infrastructure, environmental services and elected officials. The group held four (4) public meetings to discuss and develop the plan. The Southeastern Regional Planning and Economic Development District (SRPEDD) provided mapping and technical assistance, and the SRPEDD Regional Pre-Disaster Mitigation Plan served as a reference for the original Plan. The City Council adopted the Plan, after public input, at their meeting of December 20, 2007.

In July 2014, the City undertook the effort to update this Plan. Similar to the initial group, the committee formed for this update came from a wide range of disciplines. The 2014 committee membership is provided in Section 1.3. The committee met twice over the course of a 6 month period and, with the assistance of CDM Smith, prepared this update. On December ___, the City held a

public meeting to solicit comment from the public. In addition, the draft updated Plan was posted on the City's website for public review and comment from December 29, 2014 to January 16, 2015. During this review period, neighboring communities were given an opportunity to provide comments on the Plan. Appendix A provides documentation of public participation for this update. On _____, the City Council adopted the Plan at their meeting (see resolution in Appendix B).

1.3 Committee Membership

Mark Mahoney, Director	Emergency Management Department
David Fredette, City Engineer	Public Infrastructure Department
Michele Paul, Director	Environmental Stewardship Department
Sarah Porter, Conservation Agent	Environmental Stewardship Department
Jill Maclean, City Planner	Community Development
Danny Romanowicz, Commissioner	Inspectional Services Department
Chief Michael Gomes	Fire Department
Lieutenant Ricard Rezendes	Police Department
Mark McGraw	Emergency Medical Services Department
Cynthia Wallquist, Director	Community Services Department
Brenda Weis, Director	Health Department
Jeffery Stieb, Executive Director	Harbor Development Commission
Edward Anthes-Washburn, Asst. Dir.	Harbor Development Commission – Alternate
Kenneth Blanchard, Director	Department of Facilities & Fleet Maintenance
Christina Connelly *Assistant Chief of Staff*	Mayor's Office
Derek Santos	New Bedford Economic Development Council
David Camara, Associate Safety Officer and Emergency Management	Southcoast Hospitals Group/St. Luke's Hospital
Al Oliveira, Director of Facilities	New Bedford School Department
Ari Sky	Chief Financial Officer
Shannon Shreve	Solicitor's Office
Sam Ackah	New Bedford Housing Authority

Section 2
Profile of the Community

2.1 Geology, Natural Resources, and Climate

The City of New Bedford is an urban community located in southeastern Massachusetts and is bordered to the west by Dartmouth, to the north Freetown, to the east by Acushnet, and Buzzards Bay to the south. New Bedford is 54 miles south of Boston and 33 miles southeast of Providence, Rhode Island. It has a total land area of 20.14 square miles.

Geologists classify the southeastern Massachusetts area as part of the Northeast Coastal Lowlands/Coastal Plain region. The area is characterized by the conditions created over 12,000 years ago when massive glaciers receded. These characteristics include low hills; somewhat porous soils; deposits of sand and gravel; multiple swamps, lakes, rivers and ponds; and a high water table. The glaciers left behind glacial till that contains thick deposits of both sand and gravel, lying over bedrock. There are occasionally boulders, known as glacial erratics, of different rock types that were carried from northern regions and left behind as the glaciers receded. New Bedford has a relatively level terrain with gently rolling hills, with a general elevation of 50 feet above sea level and the highest point at 181.5 feet above sea level.

The water resources of New Bedford have played a central role in its development. The harbor area remains an active port, and the City has 11.4 miles of tidal shoreline. The hurricane barrier, completed in 1966, closes during storm events and protects the recreational and commercial fleet. New Bedford enjoys its reputation as a "safe harbor" because of the hurricane barrier. The stone and steel barrier extends across the mouth of New Bedford Harbor to the Fairhaven side near Fort Phoenix. It is 9,100 feet long and 20 feet above median sea level. The harbor section has two 440-ton gates in the center that can be closed during strong tides or storms to protect the inner harbor. The western section protects the City from tidal surges in Clarks Cove. Built by the Army Corps of Engineers, the hurricane barrier is the largest stone structure on the East Coast. The area protected by the barrier includes 1,400 acres of densely developed industrial and commercial properties along the New Bedford waterfront and the Acushnet River. According to the Army Corps of Engineers, as of September 2011, the hurricane barrier has prevented $24.1 million in flood damages and coastal tidal surges since it was built.

Surface water accounts for 3.9 square miles of area, and includes the Paskamansett River and three ponds: Sassaquin, Turners, and the Buttonwood Park Pond.

The Massachusetts Bureau of Dam Safety, a division of DCR, reports that there are three dams within New Bedford, of which the City owns two. The City also owns three dams outside of the City's limits, including the high risk New Bedford Reservoir Dam. Table 2-1 summarizes the dams owned by and within the City. The Assawompsett Pond Dam and Buttonwood Park Pond Dam are both rated as significant risks.

Table 2-1
New Bedford Dams

City/Town Where Dam is Located	Dam Name	Owner	Caretaker	Hazard Code*
New Bedford	Turner Pond Culvert	Acushnet Sawmill Co.	Not Named	L
New Bedford	Turner Pond Dam	City of New Bedford	City of New Bedford	S
New Bedford	Buttonwood Park Pond Dam	City of New Bedford	City of New Bedford	S
Acushnet	New Bedford Reservoir Dam	City of New Bedford	City of New Bedford	H
Dartmouth	High Hill Reservoir Dam	City of New Bedford	City of New Bedford	S
Middleborough	Assawompsett Pond Dam	City of Taunton	City of New Bedford	S

Source: Massachusetts Bureau of Dam Safety. H=High; S=Significant; L=Low.*

The Bureau of Dam Safety has jurisdictional authority over dams that meet the following criteria: dam structure six feet or higher, an impoundment of 15 acre feet[1] or more, or a significant downstream hazard as determined by staff review (e.g. campground, densely developed area, major thoroughfare, etc.). This includes government and privately owned dams. Regulations that went into effect at the end of 2003 require owners to register the dams and have them professionally inspected at the owner's expenses every two years. While the monitoring of dam condition falls to the owner, be it a private or public entity, damage from dam failure may include multiple owners and even property across municipal boundaries.

Massachusetts in general has a humid climate with temperatures that average 68 to 72 degrees in the summer and about 28 to 32 degrees in the winter. The National Climatic Data Center reports the following normal temperatures by season in New Bedford: January - 30.6 degrees and July 73.5 Degrees.

The normal annual precipitation is 47.3 inches. The growing season, from the last killing frost in the spring to the first killing frost in the fall, runs between 180 to 200 days. The area is subject to a variety of severe weather events: hurricanes, Northeasters, thunderstorms, blizzards, tornadoes, and drought. All of these are discussed more fully in Section 3.

2.2 Population Characteristics

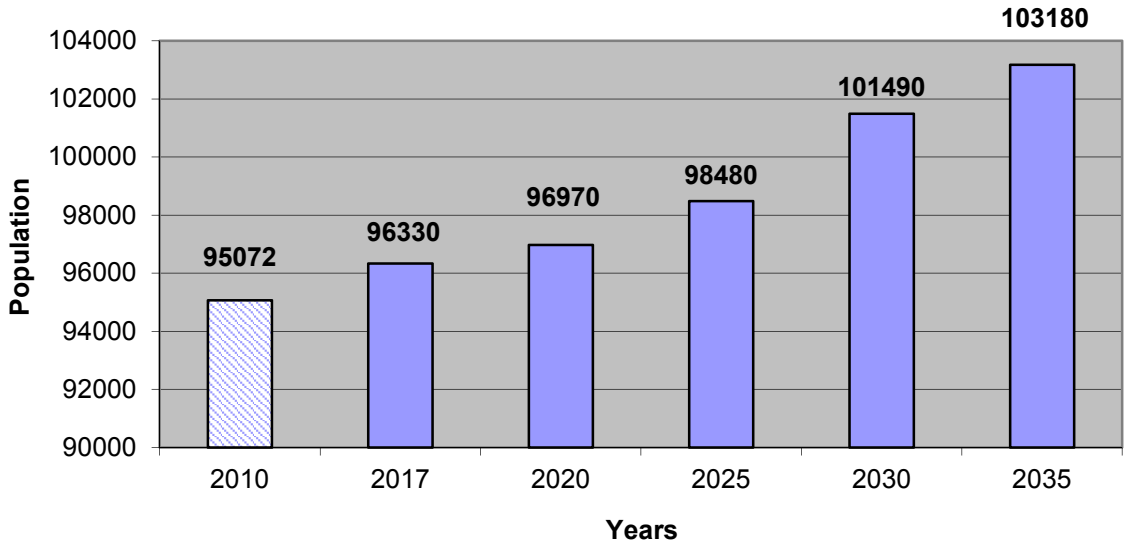
The 2010 US Census indicates that New Bedford has a total population of 95,072 with 20% of it being foreign born. With a land area of 20 square miles the average population density is 4,655 persons per square mile. The population can be broken down by ages in the following manner: 6,560 (6.9 %) under 5 years; 17,978 (19 %) between 5 and 19 years old; 56,631 (59.5 %) between 20 and 64 years old; and 13,903 (14.6%) 65 years or older. With a total of 38,761 households, the average household size is 2.4 persons.

[1] Acre foot = Amount of water that fills one acre of land to a depth of one foot, approx. 300,000 gallons of water.

New Bedford has experienced steady population increases over the past thirty years, and is expected to continue this growth. Figure 2-1 indicates census population figures and growth projections prepared by SRPEDD and MassDOT.

Figure 2-1

New Bedford Projected Population Growth



New Bedford has seen a steady number of residents whom are over 65 years of age. This age group is expected to increase as the "baby-boomer" generation ages. The number of residents over the age of 65 has varied from 15,896 (16.1%) in 1980 to 17,375 (17.4%) in 1990, back to 13,903 (14.6%) in 2010. This population generally has a higher incidence of special needs for emergency response due to health afflictions and mobility restrictions, although overall this population is a healthier and more active group than they were thirty years ago. The Federal Administration on Aging notes the following as reasons the elderly are more vulnerable to disasters:

- They have difficulty getting assistance due to progressive physical and mental impairments and other frailties that accompany aging;
- They are slower to fill out forms for disaster notification and/or disaster relief assistance;
- They are often at higher post-disaster nutritional risk and medication risk;
- They are often targeted by fraudulent contractors; and
- They may be susceptible to abuse as overall family stress levels increase in the later stages of a disaster.[2]

[2] "Disaster Preparedness for Older Americans", 2002. Business Publishers, Inc.: Silver Spring, MD, p.1.

Other vulnerable populations are youth and the disabled. Youth are vulnerable due to their need for supervision and guidance in times of emergency, especially groups of children under the care of a limited amount of adults, such as schools and daycare facilities.

The 2000 Census represents the first time that data on the disabled were collected. The Census long form allowed self-reporting by the respondent on questions that would indicate disabilities of various types:

- Sensory disability
- Mental disability
- Going outside the home disability
- Physical disability
- Self-care disability
- Employment disability

The 2000 Census reports that New Bedford had a total of 22,496 respondents to these categories. These data were not reported in the 2010 Census. Due to the ability to select more than one category, this translates into a smaller number of residents. The special circumstances of the disabled population that may affect disaster response include:

- The visually-impaired, who are reluctant to leave familiar surroundings;
- Those with mental retardation or cognitive impairment, who may not understand or may become confused;
- Guide dogs and other assistance animals that may become disoriented in a disaster;
- Proper transport techniques that are required to reassure anyone being carried that they will not be dropped;
- Many respiratory illnesses that are aggravated by stress;
- Medically-dependent individuals, who may not be able to communicate their needs; and
- All temporary shelters that must meet accessibility standards.[3]

The City has a noticeable population of undocumented immigrants that are not counted by the Census. Presently there are no reliable estimates for the size of this population, but social service and law enforcement report it is sizeable. Many of these immigrants do not speak English. The population includes Mayans from Guatemala and other Central Americans from El Salvador and Honduras. As a population that does not wish to attract attention, this group presents a particular challenge when it comes to disaster notification.

2.3 Transportation Network

New Bedford has a total of 282 miles of roadway. Route 140 acts as the major north/south route, along with Route 18, and Route 6 as a major east/west route. Nearly 3 miles of Interstate 195 runs

[3] Ibid, p.20.

through the center of the City, dividing it into a north and south area. According to the 2012 SRPEDD Regional Transportation Plan, eight (8) bridges are classified as functionally obsolete.

Table 2-2
New Bedford Bridges that are Classified as Functionally Obsolete

Miles of Roadway	*Interstate*	*Arterials*	*Collectors*	*Local*	*Total*
	2.95	72.33	21.19	185.32	281.79
Under	***Over***		***Yr. Built***	***Owner***	
Kings Highway	Route 140		1969	State	
Route 140	Railroad Bay Colony		1970	State	
Route 6 West Bound	Route 18		1973	State	
Route 6 West Bound	Route 18/Relief		1973	State	
Hwy Hillman Street	Route 18 & Ramp A		1973	State	
Interstate 195	County/ State Streets		1965	State	
Interstate 195	Route 18 /Ashley Street		1965	State	
Route 140 Southbound	Railroad CSX		1969	State	

Source: SRPEDD and MassDOT

2.4 Land Use

Statistics compiled from the 2011 National Land Cover Dataset (NLCD) from the United States Geological Service (USGS) indicate the following breakdown of land uses in New Bedford:

- 2.2 acres agriculture (0.2%)
- 1,447 acres open space (11.2%)
- 2,037 acres wetland (15.8%)
- 2,595 acres high density development (20.0%)
- 3,974 acres medium density development (30.7%)
- 1,461 acres low density development (11.2%)
- 1,282 acres natural/undisturbed (9.9%)
- 111 acres water (1%)

Residential growth has been steady. Between 2008 and 2013 inclusive, 148 single-family residential building permits were issued, an average of 25 per year.

The housing stock in New Bedford is mixed. According to the 2010 Census, 29.7 % of the units (12,868) are single-family detached units, with the other units in multi-family or attached structures. Of the City-wide total of 43,256 housing units, 80.6% (34,855) were constructed prior to 1969 and

56.5% (24,431) were constructed prior to 1939. The Census also records 114 mobile homes in the City.

Statistics compiled from the 2011 NLCD indicate that, as of 2011, there are approximately 2,000 acres of land within the 100-year FEMA flood zone, of which 460 acres are developed land, 270 acres are undeveloped land, and the remaining 1,270 acres are classified as wetlands. Table 2-3 indicates that, while there are many properties in New Bedford within the 100-year FEMA flood zone and covered through the National Flood Insurance Program (NFIP), there has been one repetitive loss property.

Table 2-3
New Bedford and the National Flood Insurance Program (NFIP)

Policies in Force (#)	*Property Value Insured ($)*	*Total # Losses Paid Out*	*Total Losses ($)*	*Total Repetitive Loss Structures (Two or more Claims)*
248	80,401,100	27	602,000	1

Source: FEMA.

2.5 Cultural and Historical Sites

The Buttonwood Park Zoo, originally created in 1894 and completely renovated in the late 1990s, is located on approximately 8 acres of its namesake park. The zoo is a year round operation with over 200 animals and received approximately 146,000 visitors in 2013.

The New Bedford Whaling National Historical Park (Park) was established in 1996 as part of the National Park System. It commemorates the City's heritage as the world's preeminent whaling port during the 19th century. The Park covers 34 acres of over 13 City blocks in the Downtown Historic District (also a National Historic Landmark District) and waterfront areas. The Park includes a visitor center and historic sites including the New Bedford Whaling Museum, the Seamen's Bethel, the Schooner Ernestina, and the Rotch-Jones-Duff House and Garden Museum. Overall, there are more than 70 properties, most of which are historic structures in private ownership and are within the Park boundaries.

Other major historical and cultural sites include: New Bedford Art Museum, and the New Bedford Free Library Special Collections, both located on City Hall Square in the Downtown Area/National Historic District; the New Bedford Museum of Glass Museum, located on Wamsutta Street; the New Bedford Fire Museum, located on Bedford Street; Museum of Madeiran Heritage, located on Hope Street; and the New Bedford Military Museum located at Fort Taber.

2.6 Utilities/Special Facilities

The New Bedford wastewater system serves approximately 96% of the City's population and about 69% of the land area. In addition, some service is extended to residences in Dartmouth and Acushnet. The south and central parts of the City are served with a combined sewer/stormwater system, while the northern part of the City is serviced by separate sanitary sewers. The system consists of approximately 266 miles of sanitary and combined gravity and pressure sewers and 29 pump stations. The secondary treatment plant is located at Fort Rodman. There is a special flood control pumping

station owned by the City that can be used during a major hurricane event to re-direct wastewater from the City's main interceptor to a discharge pipe in Clarks Cove. This pump station also acts as a flood control station that is used during low tide to pump stormwater to Clarks Cove to protect the south end of the City.

New Bedford receives its water from the Assawompsett Ponds bordered by the towns of Freetown, Lakeville, Middleboro and Rochester. The water treatment plant is located in the town of Rochester on the shore of Little Quittacas Pond. The treated water from this facility is pumped directly to the north end of the City and to the High Hill reservoir from which it is distributed. A plan completed for the Department of Public Infrastructure indicates that the current system is adequate to cover the growth demands through the year 2020.

New Bedford Port has the largest United States Department of Agriculture (USDA) cold treatment facility in North America. The port is part of the New Bedford Free Trade Zone, which provides manufacturing opportunities for duty-free importers and exporters. The port offers a ship agency, freight forwarding, stevedoring services, blast freezing, warehouse and truck-brokering facilities all in one location. The port is the largest break bulk handler of perishable items in Massachusetts and adjacent states. The New Bedford Port also has a waterfront warehouse capacity that is one of the largest USDA approved cold treatment centers on the east coast.

Within the harbor there are over 950 slips, including 198 at the publicly managed Pope's Island Marina. These are all protected from major storms by the hurricane barrier. In addition, there is ferry service from New Bedford to Martha's Vineyard and Cuttyhunk Island.

The New Bedford airport includes two runways, a FAA control tower, over 150 registered aircrafts, and a flight school. There are over 55,000 annual operations including takeoffs and landings at this 823-acre facility.

Table 2-4 presents the utility providers existing in New Bedford. Water and wastewater services are provided by the City, whereas electricity and natural gas are provided by NSTAR.

Table 2-4
Utility Providers Existing in New Bedford

Community	*Electric Provider*	*Gas Provider*	*Water Source*	*Wastewater*	*Hospitals*
New Bedford	NSTAR Electric	NSTAR Gas	Municipal System	Municipal Sewer	St. Luke's

2.7 Conclusion

The following general characteristics, drawn from this profile, are relevant to the design of a disaster mitigation strategy:

- New Bedford is a growing community with a dense downtown area and less developed outlying areas. Development will take the form of re-development and infill in the downtown, and new development in the northern areas of the City.

- The historical development pattern has concentrated development along the Acushnet River and New Bedford Harbor. The core downtown area includes many buildings at the river's edge and an active harbor. There are many properties in flood zones (248 participate in NFIP) but only one repetitive loss structure.
- The hurricane barrier protects a large land area and the harbor. A portion of the City lies outside this protective dike, and this peninsula includes a critical facility, the wastewater treatment plant. A special pump station exists to provide an option for re-directing the wastewater treatment plant's outfall from the Fort Rodham location to Clarks Cove, if this is warranted, in addition to providing flood protection for a substantial portion of south New Bedford, which regularly requires pumping as a result of precipation events.
- The City maintains the hurricane barrier, with the exception of the navigation gates, and the barrier across New Bedford and Fairhaven Harbor, which are maintained by the Army Corps of Engineers.
- The Buttonwood Park Zoo represents a unique resource that needs its own natural disaster plan to protect the animals and the public.
- The aging housing stock means many of the buildings pre-date current building codes, and the infrastructure in general (bridges, roadways, and dams) is aging.
- The City owns three dams that pose a significant or high risk to property and populations.

Section 3
Hazard Identification and Risk Assessment

This section will discuss the natural hazards and evaluate the risk they pose to residents, homes and businesses. Each natural hazard is identified and profiled with information on the hazard's dimensions, history, risk factors, and potential economic impact. Risk will be examined in terms of the likelihood of the natural hazard occurring; the geographic area that the natural hazard could affect; and the impacts that could be expected. The likelihood or probability of an event occurring is determined by reviewing historical events and consulting expert opinion, while GIS mapping is used to evaluate the area that could be affected. Information on the development characteristics of New Bedford from Section 2 is used to estimate the impacts of natural hazards on critical facilities, vulnerable populations, and infrastructure. Mapping associated with these hazards are provided in Appendix C.

New Bedford uses the same Hazard Index used by the SRPEDD to rate the categories of natural hazards in terms of likelihood, location, and magnitude of impacts (see Table 3-1). Each of these criteria was rated with a point value along a scale as indicated in Table 3-2. The Hazard Index in Table 3-1 is a gross assessment that was used to shape the focus areas of New Bedford's Plan.

3.1 Flood Related Hazards

The 2013 Massachusetts Hazard Mitigation Plan records flooding as the number one hazard faced within the region.[1] This is not surprising given that a number of natural hazards can cause flooding including: hurricanes, Nor'easters, thunderstorms, and winter storms. New Bedford has only a few flooding problems with the 100-year floodplain, although flooding after a hurricane may be more severe, and flooding associated with upstream dam releases has been an issue. The growth of New Bedford has meant that pervious land has become impervious, increasing the amount of runoff from normal precipitation. According to MassGIS and NLCD, the total area developed during 1971 - 2011 was 1,058 acres or an additional 8 % of the City's land area.

[1] Massachusetts Hazard Mitigation Plan, 2013, p. 163.

Table 3-1
Hazard Index Summary

Natural Hazard	*Likelihood/ Frequency*	*Impact Area Assessment*	*Severity/ Magnitude*	*Hazard Index*
FLOOD RELATED HAZARDS				
Hurricanes/Tropical Storms	2	2	1	5
Nor'easters	3	1	1	5
Winter Storms/Blizzards	3	1	1	5
Thunderstorms	3	1	0	4
Coastal and Riverine Flooding	2	1	1	4
Dam Failures	1	1	1	3
WIND RELATED HAZARDS				
Hurricanes/Tropical Storms	2	2	1	5
Nor'easters	2	1	1	4
Winter Storms/Blizzards	3	1	1	5
Thunderstorms	3	1	0	4
Tornadoes/Waterspouts	1	1	1	3
FIRE-RELATED HAZARDS				
Wildfires	1	1	1	3
Drought	1	3	0	4
GEOLOGIC HAZARDS				
Earthquakes	1	1	0	2
Landslides	1	1	0	2
Tsunami	0	1	2	3
EXTREME TEMPERATURES				
Extreme Temperatures	3	3	0	6

Table 3-2
Hazard Index Scale

FREQUENCY/ LIKELIHOOD		
POINT VALUE	**CATEGORY**	**CHARACTERISTICS**
3	Highly Likely	Near 100% Probability in the next year
2	Likely	Between 10 – 100% probability in the next year; or at least one chance in 10 years
1	Possible	Between 1- 10% probability in the next year; or at least one chance in the next 100 years
0	Unlikely	Less than 1% probability in the next 100 years

IMPACT ASSESSMENT		
POINT VALUE	**CATEGORY**	**CHARACTERISTICS**
3	Large	Relative to total land area and concentrations of population/structures and critical facilities
2	Medium	Relative to total land area and concentrations of population/structures and critical facilities
1	Small	Relative to total land area and concentrations of population/structures and critical facilities

MAGNITUDE/SEVERITY		
POINT VALUE	**CATEGORY**	**CHARACTERISTICS**
3	Catastrophic	Multiple Deaths. Complete shutdown of facilities for 30 days or more. Property severely damaged >50%.
2	Critical	Injuries and/or illness result in permanent disability. Complete shutdown of critical facilities for at least two weeks. Property severely damaged <50%, >25%.
1	Limited	Injuries and/or illness do not result in permanent disability. Complete shutdown of critical facilities for more than one week. Property severely damaged <25%, >10%.
0	Negligible	Injuries and/or illnesses are treatable with first aid Minor quality of life loss. Shutdown of critical facilities and services for 24 hours or less. Property severely damaged <10%.

(Source: State of North Carolina Emergency Management Agency)

3.1.1 Hurricanes/Tropical Storms

While New England is not the area of the United States most burdened by hurricanes, the Atlantic coast of the United States can expect to see an average of two major hurricanes every 3 years[2] and New England can expect one major landfall in each decade.[3] This is due in part due to the geography of Massachusetts; its projection easterly into the Atlantic places it in the typical path of storms that originate in Cape Verde or the Bahamas. Hurricanes are tropical storms that obtain wind speeds of 74 miles per hour or greater and are accompanied by heavy rainfall. Hurricanes are classified based on wind speed, barometric pressure and storm surge. Table 3-3 presents the Saffin-Simpson Scale for hurricanes. Since hurricanes are formed at sea, storm surge is a concern when hurricanes make landfall. The National Weather Service reports, "Southern New England has been affected by forty-one such storms since 1900, 12 of which made landfall with significant impact." [4]Table 3-4 reflects the history of these events. The heaviest areas of hurricane damage are on the eastern side of landfall, as the storm moves in a large counter-clockwise spinning spiral. The most damaging storms have made landfall and tracked to the west of this region, including the major 1938 unnamed hurricane that made landfall in Milford, Connecticut and the 1954 Hurricane Carol that made landfall in Old Saybrook, Connecticut. Figures 3-1 and 3-2 indicate the frequency of hurricane events in southern New England during the past hundred years. As it looks highly likely that southeastern Massachusetts will experience a hurricane, New Bedford is likely to feel the effects. Typical problems for New Bedford are power outages lasting one-three days.

Figure 3-1

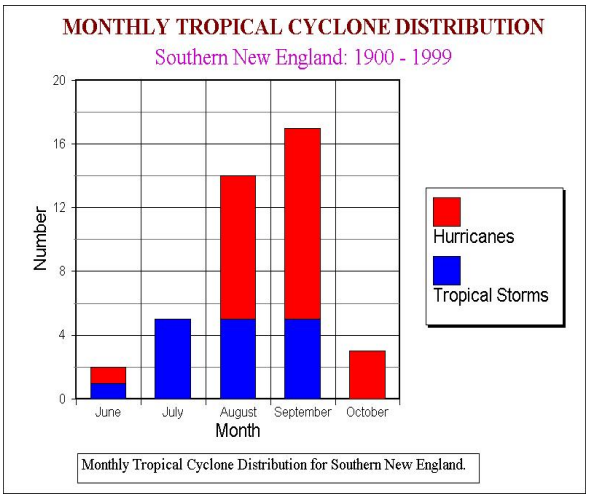
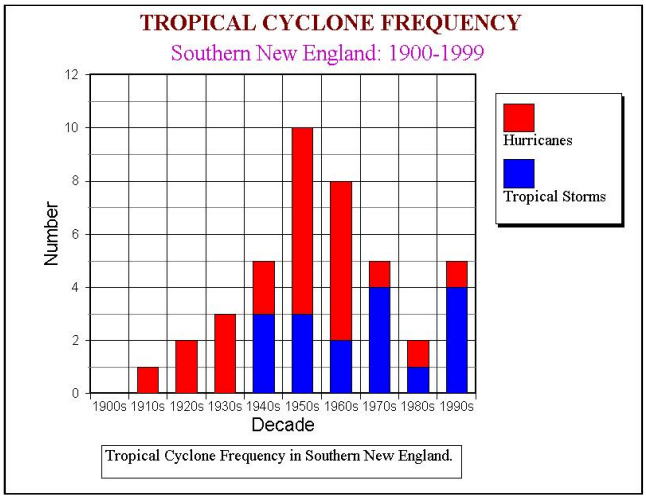


Figure 3-2



Vallee, D. "A Centennial Review of Major Land Falling Tropical Cyclones in Southern New England. [Available at: www.erh.noaa.gov/er/box/tropical_cyclones.htm], p.2.

[2] Jarrel et al, "The Deadliest, Costliest, and Most Intense United States Hurricanes from 1900 – 2000. NOAA Technical Memorandum NWS TPC-1 Oct 2001. [Available at www.aoml.noaa.gov/hrd/Landsea/deadly/index.html],p.4.
[3] Vallee, D. "A Centennial Review of Major Land Falling Tropical Cyclones in Southern New England. [Available at: www.erh.noaa.gov/er/box/tropical_cyclones.htm], p.2.
[4] Vallee "A Centennial Review", p 1.

Table 3-3
Saffir-Simpson Scale for Hurricane Classification

Strength	*Wind Speed (mph)*	*Pressure (millibars)*	*Storm Surge (feet)*
Category 1	74-95	>980mb	4-5 ft.
Category 2	96-110	965-979mb	6-8 ft.
Category 3	96-113	945-964	9-12 ft.
Category 4	131-155	920-944	13-18 ft.
Category 5	>135	919	18 ft.
Tropical Cyclone Classification			
Tropical Depression		20-34 kt or 23-39 mph	
Tropical Storm		35-64 kt or 40-73 mph	
Hurricane		65+ kt or 74+ mph	

Table 3-4
History of Southern New England Hurricanes

	Name	*Date*	*Intensity*
Fourteen significant tropical cyclones impacted southern New England, 1900-2012. Storm intensity at landfall is given by the Saffir/Simpson scale or TS for tropical storm.	Unnamed Fourteen significant tropical cyclones	7/21/1916	CAT 1
	Unnamed	9/21/1938	CAT 3
	Unnamed	9/14-15/1944	CAT 3
	Carol	8/31/1954	CAT 3
	Edna	9/11/1954	CAT 3
	Diane	8/18-20/1955	TS
	Donna	9/12/1960	CAT 2
	Belle	8/9-10/1976	CAT 1
	Gloria	9/27/1985	CAT 2
	Bob	8/19/1991	CAT 2
	Bertha	7/12-13/1996	TS
	Floyd	9/18/1999	TS
	Irene	8/28/2011	TS
	Sandy	10/29-30/2012	TS

Source: Vallee, D. "A Centennial Review of Major Land Falling Tropical Cyclones in Southern New England. [Available at: www.erh.noaa.gov/er/box/tropical_cyclones.htm]

In assessing the magnitude or severity of damage from a hurricane in southeastern Massachusetts, consideration must be given to the timing of the event. Hurricanes that make landfall during high tide will have much greater storm surge and thus flood larger areas. In addition, hurricane season runs from June 1 to November 30, a period that includes the summer population swells experienced by several southeastern Massachusetts communities. The timing of the storm relative to other weather

events also has a bearing on the overall impact of the hurricane. If a hurricane follows another hurricane or a major rain event, the effects can be magnified, as flooding is greater, and weakened or loosened trees are more susceptible to toppling.

The organization SeaPlan, an independent, nonprofit ocean science and policy group was contracted by the Buzzards Bay National Estuary Program, and oversaw a study that assessed potential vulnerability and mitigation measures for infrastructure in the communities surrounding New Bedford Harbor for several sea level rise (SLR) and storm surge scenarios. SeaPlan performed the inundation modeling using the National Oceanic and Atmospheric Administration's Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model for various SLR and hurricane parameters. Modeling results were aggregated by hurricane Categories 1 through 4 for each SLR condition (0, 1, 2, and 4 foot SLR). For this Plan, the New Bedford map C-1, *Hurricane Surge Inundation Zones,* depict the inundation zones in New Bedford for Category 1 to Category 4 hurricanes with no sea level rise, using the modeling results from SeaPlan's study. Enlargements of this map, showing the northern and southern halves of New Bedford, are also provided (maps C-2 and C-3).

The severity of an event considers the potential for loss of life, property damage, and critical facility or business interruption. Most experts anticipate that the next major New England hurricane will have severe impacts because present residents are unaware of the serious danger and major property investment has increased the value of structures in the region**.** Given that the last major storm event was over 20 years ago, there is concern that those who have re-located to the area during this period or come of age during this period, are unaware of the real danger posed by a powerful hurricane. NOAA (National Oceanic and Atmospheric Administration) estimates that 80-90% of the population now living in United States coastal areas has never experienced a major hurricane.[5] This lack of firsthand knowledge can cause lax response to warnings and poor or little preparedness.[6] When residents are slow to respond to warnings the severity of impacts can be expected to be greater.

The new population has come with increased residential construction. As described in Section 2, New Bedford has had new housing constructed to accommodate the population growth during the years 1980 – 2013. Given the rating categories within severity of impacts (see Table 3-2), "limited" appears to fit the severity of damages New Bedford could expect, even though a hurricane is "likely" and will have a moderate impact on the City. Of course, a powerful storm on a particular tract could inflict much greater damage, especially the unlikely scenarios that could lead to storm surge overtopping the hurricane barrier.

3.1.2 Nor'easters

The Massachusetts Hazard Mitigation Plan reports that while hurricanes strike the area with much more force than Nor'easters, the state suffers more damage from Nor'easters because they are a more frequent occurrence.[7] Nor'easters are a common winter event in New England (1-2 each year[8])

[5] "Hurricanes: Unleashing Nature's Fury", August, 2001, ARC 5030, NOAA/PA 94050, p.8.
[6] Jarrell, J. "The Deadliest, Costliest, and Most Intense United States Hurricanes from 1900 – 2000. NOAA Technical Memorandum NWS TPC-1, [Available at www.aoml.noaa.gov/hrd/Landsea/deadly/index.html], p. 8.
[7] Massachusetts Hazard Mitigation Plan, 2013, p.399.
[8] Ibid.

and they bring high winds and sustained rains. They are more problematic, in part because they have a longer duration – 12 hours to 3 days, versus 6 to12 hours for hurricanes. These storms typically occur in late fall and early winter. Nor'easters often produce high winds, heavy snow, rain, and waves that crash onto Atlantic beaches, often resulting in beach erosion and structural damage. Many southeastern Massachusetts communities have flooding associated with the heavy precipitation of Nor'easter storms. Problems can be exacerbated when the rainfall and the melting of snow and ice are added to the flow. The large chunks of ice that are freed can clog drainage passages and increase localized flooding. This flooding can affect private residences, businesses, and public infrastructure such as roadways and storm drains.

Over the past 20 years, several Nor'easters have impacted New Bedford. For example, in March 1994, a Nor'easter tracked to the southeast of Cape Cod, causing heavy snow and high winds. In southeastern Massachusetts, the snow turned to rain and wind gusts were up to 60 mph. On October 7, 2005, a Nor'easter combined with the remnants of Tropical Storm Wilma, resulted in heavy rainfall, strong winds and coastal flooding[9].

Overall, based on Table 3-2, Nor'easters are highly likely in New Bedford, but they have a small impact on the area and limited severity.

3.1.3 Winter Storms and Blizzards

New Bedford falls within a band of average annual snowfall of 36 to 48 inches per year. The hazard map for New Bedford C-4, *Average Annual Snowfall,* indicates the snowfall pattern. According to NOAA, the greater Providence area (where New Bedford is located) has a 20% chance each year of having at least one snowfall amounting to 12 inches or more, and is likely to experience 9.9 snowstorms each year. While melting snow adds to flooding, snowfall also presents a non-flooding hazard as access to critical facilities may be compromised by large amounts of snowfall. Variations on this hazard are a snowstorm in combination with rain that produces a very heavy wet snow or ice storms both of which weigh down trees and power lines. In New Bedford one of the most frequent problems from heavy snowstorms is roof collapse.

In February 2004, the American Meteorological Society initiated a rating scale for winter storms (see Table 3-5). The Category 1- 5 scale is intended to be used to assess damage rather than predict impacts. Snowstorms are difficult to predict and small temperature fluctuations mean the difference between snow and rain. The scale which includes increasing intensity- notable, significant, major, crippling and extreme storms, assesses the amount of snow, area affected, and population impacted.[10]

[9] 2013 State Hazard Mitigation Plan, page 405.
[10] Allen, Diane. "Snow Watchers now rate the effects from 1-5." *The Boston Globe*, March 17, 2004, p.B4.

Table 3-5
Northeast Snowfall Impact Scale

Category	*Cat 1 Notable*	*Cat 2 Significant*	*Cat 3 Major*	*Cat 4 Crippling*	*Cat 5 Extreme*
Snow Depth	4-10 inches	10+ inches	10-20 inches	20+ inches	10, 20, or 30 inches
Area	Size of RI	Southern New England	1-3 times NY State	Northeast	Northeast
Population Affected	10 million	10-20 million	20-40 million	50 million	60 million

(Source: American Meteorological Society)

Winter storms include ice storms, which is defined as rain falling and freezing on contact with cold objects, creating ice build-ups. Ice storms can create dangerous walking and driving conditions, and cause power failures. Ice storms occur most frequently in late December and early January, but can occur anytime between November and March. Between 1971 and 2012, Bristol County had eight ice storm events[11].

A blizzard is a winter snowstorm with sustained or frequent wind gusts to 35 mph or more, accompanied by falling or blowing snow reducing visibility to or below a quarter-mile, for over a 3-hour period. Extreme cold temperatures can also occur with blizzard conditions. Over the past 20 years, blizzards have impacted New Bedford. A storm from March 13 to March 17, 1993 produced high winds and heavy snow in Massachusetts, with 10 to 20 inches of snow across the state[12]. Blizzard conditions were recorded on March 13. On January 7 and 8, 1996, a blizzard produced between 15 and 25 inches of snow in Plymouth and Bristol Counties. Gale force winds were also associated with this storm[13].

Overall, winter storms are highly likely, but they have a relatively small impact, with limited damage.

3.1.4 Thunderstorms

Thunderstorms affect localized areas, compared to winter storms and hurricanes. Massachusetts typically experiences between 10 and 30 thunderstorm days each year. Localized thunderstorms can produce significant rainfall in a short period of time, damaging winds, hail and cause fires due to lightning strikes. Power lines may be downed due to high winds or ice accumulation. Roads may become impassable due to flooding, downed trees or ice. Lightning can damage property or cause injury. Damaging thunderstorms have affected Massachusetts, resulting in federal disaster declarations. In June 1998, slow-moving thunderstorms produced 6 to 12 inches of rain over much of eastern Massachusetts, resulting in urban, small stream, and river flooding. Bristol County was one of several counties that received a presidential disaster declaration for the Individual Household

[11] 2013 State Hazard Mitigation Plan, page 464
[12] 2013 State Hazard Mitigation Plan, page 466
[13] 2013 State Hazard Mitigation Plan, page 467

Program[14]. On May 24, 2009, Bristol County experienced a severe thunderstorm that caused minor flooding, winds in excess of 70 mph and quarter-sized to golf-ball sized hail[15].

Thunderstorms are highly likely, based on Table 3-2. Their impact is small and their severity is negligible.

3.1.5 Coastal and Riverine Flooding

The map C-5, *100-Year FEMA Flood Zone*, indicates land area within the 100-year FEMA flood zone. Historically, as shown in Table 2-3, there have been few property losses within this zone. To mitigate future flood damage and preserve areas to hold floodwaters in this area, consideration should be given to conserve properties when setting priorities for acquisitions and conservation restrictions.

Besides coastal flooding related to storms from the sea and wetland flooding, New Bedford is subject to localized urban or street flooding. This flooding is connected to the inability of existing drainage systems to handle the flow from certain storm events. This is likely due to the initial sizing of the pipes and the increased amounts of impervious surface in the City, or to the size of particular storms. In addition, the spacing of storms can affect the capacity of the drainage system to move the storm water away from infrastructure and property. The City has undertaken several multi-year sewer separation projects to increase storm drainage capacity. Within New Bedford, there are a half-dozen highly traveled intersections that experience flooding and temporary closure to vehicular traffic during heavy rain events. These heavy rains may also flood basements and cause damage to heating systems and other utilities. Future mitigation actions will address these areas subject to flooding.

Flooding in New Bedford is possible, but the impact is small and the severity is limited.

3.1.6 Dam Failures

The Massachusetts Bureau of Dam Safety reports that the region's dams, like the other parts of New England infrastructure, are an aging infrastructure that is expensive to repair. Routine maintenance is necessary to control the growth of trees and keep the area clear so defects can be detected. In addition to aging, the region's dams are often functioning beyond their original design. The increase in impervious surfaces leads to increased flows in some streams and rivers and thus greater demands are placed on the dams. In 2003, a dam in a north shore community "overtopped" after heavy precipitation. When this happens, the dams can fail quickly as the earthen structures are subject to erosion pressures.

The Riverways Program within the Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement (DFWELE), has been studying the larger environmental costs of both operational dams and dam failures. Dam failures may cause loss of life and property downstream, but they may also degrade the environment. Many dams act as a holding area for contaminated sediments. With a dam failure, these sediments are released and can damage wildlife and the ecology of the river system. An associated cost of dam failures is the potential for such destruction to affect fish ladders or culverts for directing water. The Riverways program is looking to develop an

[14] 2013 State Hazard Mitigation Plan, page 438
[15] 2013 State Hazard Mitigation Plan, page 439

assessment tool for evaluating dams for all aspects of safety, including environmental safety. The Riverways Program is also interested in evaluating dams for the potential for removal.

A dam failure is possible, impacting a small area with limited severity.

3.2 Wind Related Hazards

A number of the storm events discussed under Section 3-1 also represent wind hazards to the region. Hurricanes, blizzards, winter storms, and Nor'easters typically have high winds that can topple trees, knock out power lines, carry dangerous debris and cause damage to coastal areas. Consistent with flooding, the occurrence of these storm events can be expected to be likely, with a frequency of 1 to2 times each year, meaning that southeastern Massachusetts communities need to be prepared for high wind events. Wind has primary and secondary impacts. Property damage may occur as roofs are blown off or power lines blown down, as a primary impact but this is often followed by secondary impacts, such as the debris from one structure is blown into another structure or vehicle, and downed power lines cause fire or electrocution.

Massachusetts is located within Wind Zone II, with speeds up to 160 mph, as defined by the American Society of Civil Engineers (ASCE) construction standards. The wind exposure standard is used to determine the construction needed to withstand an average wind gust lasting 3 seconds at 33 feet off the ground. The ASCE standards are only used for high-rise structures, but the mapped zones indicate wind patterns as determined through readings and modeling. These patterns are consistent with the general regional weather patterns that indicate inland areas have less severe winds than coastal areas. The Massachusetts State Building Code has divided the state into four wind zones. New Bedford is located in the wind load zone of 110 mph, the highest zone in the state.

3.2.1 Tornadoes/Waterspouts

Occasional contributors to wind hazards are tornadoes. Since 1950, the southeastern Massachusetts region has experienced 15 tornadoes and one of these in September of 1972 is recorded for downtown New Bedford, as shown on the map C-6, *Tornado Incidence*. This event was of the lowest rating F0. In August 28, 1970, there was waterspout of the coast of New Bedford with a rating of F2. A waterspout is a tornado over a water surface, such as a bay or ocean. Table 3-6 lists the dates and intensity of the event as determined by the tornado Fujita Scale, which is detailed in Table 3-7. Within this region, tornadoes tend to be more likely in the months of May to September and the hours of 3 to 6 PM. In Massachusetts, the estimated probability of a tornado occurring is 0 to 0.4 days per year[16]. The National Weather Service reports that despite technological advances in equipment, the warning window for a tornado is still only about 2 minutes. In addition, this warning is very general, typically covering an area as large as a county[17]. Massachusetts ranks nationally as 35th in occurrences of tornadoes for the period 1950 – 1995, but 16th in fatalities and 12th in property damages based on these same events[18]. Massachusetts can expect on average three tornadoes per year throughout the

[16] 2013 State Hazard Mitigation Plan, pg. 4
[17] Interview with Glenn Field, July 2003.
[18] http://nebraskaweather.unl.edu/severe/USspc_state_tornado_information_alpha_2.htm

State[19]. Tornadoes and other natural hazards that bring high winds, can affect the entire southeastern Massachusetts region. Thus all populations are vulnerable, but given that 38% of tornado fatalities are in mobile homes[20], mobile home park residents are a more vulnerable group than the general population. The higher fatalities does not reflect the fact that mobile home parks are more likely to be hit by a tornado, but rather that if hit, mobile homes are more vulnerable to damage. The Census reports that in New Bedford there are 114 mobile homes in the City.

Table 3-6
Tornadoes 1950 – 1995 - Bristol & Plymouth Counties

Bristol County	*Date*	*F-Scale*
	June 9, 1953	F3
	September 7, 1958	F0
	August 9, 1968	F1
	August 9, 1968	F1
	August 2, 1970	F1
	August 28, 1970	F2
	September 14, 1972	F0
	August 6, 1997	F0
	July 23, 2008	F0
Plymouth County	*Date*	*F-Scale*
	September 7, 1958	F0
	July 4, 1964	F1
	June 9, 1965	F0
	November 18, 1967	F2
	August 9, 1968	F1
	September 16, 1986	F1
	July 10, 1989	F1
	July 10, 1989	F0
	August 20, 1997	F0
	July 24, 2012	F0

[19] http://www.ncdc.noaa.gov/img/climate/severeweather/small/avgt5095.gif
[20] http://nebraskaweather.unl.edu/severe/UStormfacts.htm

Table 3-7
Fujita Tornado Damage Scale

SCALE	WIND (MPH)	TYPICAL DAMAGE
F0	< 73	Light Damage: Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged
F1	73-112	Moderate Damage: Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable Damage: Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground
F3	158-206	Severe Damage: Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating Damage: Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	Incredible Damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.

In summary, based on Table 3-2, wind damage due to hurricanes, Nor'easters, winter storms or thunderstorms is either likely or highly likely in New Bedford, and would affect a small geographic area and population base, thus having limited severity. A tornado is possible and would impact a small area, with limited severity.

3.3 Fire-Related Hazards

3.3.1 Wildfires

Wildfires are a natural part of the southeastern Massachusetts ecosystem. Fires keep the forest floor clean of debris, encourage the growth of grasses that serve as wildlife feed, and ensure that trees have plenty of room to grow. Natural fires, recurring in a cyclical manner, can recycle nutrients and create a diversity of natural habitats. In these ways, wildfires that occur in isolated areas can be a positive force. Increasingly, however, development is encroaching into isolated areas and wildfires present a danger to human life and manmade facilities. Forest fires that might have occurred in remote areas are now potential forest fires in people's backyards. The dual issues of human suppression of forest fires and human encroachment into forest areas, has increased the risks associated with wildfire. Portions of southeastern Massachusetts are classified as "pine barrens". These are areas where the vegetation is predominately pitch pine with an understory of scrub oak and black huckleberry. Not only is this vegetation highly flammable, the ecosystem of the pine-barrens relies on periodic fire to perpetuate the barrens[21]. Table 3-8 summarizes the vegetative cover in southeastern Massachusetts.

[21] Barbour, Henry et al, "Our Irreplaceable Heritage: Protecting Biodiversity in Massachusetts" 1998, p.46-7 (NHESP & MA Audubon).

The dispersion of growth into rural and undeveloped areas described Section 2 is consistent with the national phenomenon documented in discussions of the Wildlands/Urban Interface. The Wildlands/Urban Interface is getting attention because as development (particularly low-density residential development) pushes into flammable vegetative areas, the threats of wildfires increase.

Table 3-8
Vegetative Coverage in Southeastern Massachusetts

Vegetation Type	*Acres*	*Percent of Total**
Pitch Pine/Scrub Oak	120,332.00	23%
Northern Hardwood	41,423.49	8%
Red Maple Dominant	19,191.91	4%
Oak/Maple Birch	3,908.96	1%
Open Meadow	7,283.46	1%
Forested Wetlands	56,101.70	11%
Mixed Hardwood Pine	42,023.78	8%
Suburban Forest	92,233.93	18%
Water Bodies/Beaches/No Vegetation	132,883.69	26%

The map C-7, *Wildfire,* indicates vegetative coverage of the City that can be used to assess flammability. Pitch pine/scrub oak vegetation is resiny and waxy, characteristics that make it the most highly flammable vegetation in the region. The red areas on map C-7 are pitch pine/scrub oak vegetation in New Bedford.

In conclusion, the probability of wildfire in New Bedford is possible and the area that could be affected is rated in Table 3-2 as small. The severity of the impacts that could be expected from wildfire in the region are best categorized as limited.

3.3.2 Drought

Drought is the main factor that determines the intensity of a wildfire season; the less moisture present in trees and vegetation, the more likely they are to ignite and the hotter they will burn. Table 3-9 indicates the amount of time it takes for vegetation to dry after rainfall, to reach its point of flammability.

Table 3-9
Drying Hours to Reach Flammability

Size of Fuel	*Hours Post Rain to Reach Flammability*
¼" diameter or less	1 hour
¼ – 1" diameter	10 hours
1 - 3" diameter	100 hours
4 – 7" diameter	1,000 hours
8" + diameter	10,000 hours

Source: MA Bureau of Fire Control

Beyond its role as a factor leading to wildfire, drought also has impacts on public safety for all firefighting activity, agricultural production, and economic vitality of large water users such as golf courses or industrial processes. Drought can also affect groundwater sources and surface water reservoir supplies. Massachusetts has developed five levels to characterize drought severity: normal, advisory, watch, warning, and emergency. Periods of drought are not unheard of, with the 1960's, and a few years in the 1980's, and more recently 2001-2002 and 2012 being notable times of water stress in the southeastern region[22]. The Department of Conservation and Recreation (DCR) precipitation index divides Massachusetts into six regions. New Bedford is located within the Southeast Region. The New Bedford municipal water system has not experienced a major drought or even instituted a water ban, and, under the Massachusetts Water Management Act, has prepared a drought plan.

A drought is possible and it would impact a large area of the City, but the severity is negligible.

3.4 Geologic Hazards

3.4.1 Earthquakes

The hazards that present the least risk to southeastern Massachusetts are geologic hazards such as earthquakes, landslides and tsunamis. The United States Geological Service (USGS) lists the region as one of low risk for earthquakes, although small-scale earthquakes (under 3.5 on the Richter scale) are common in the region. Table 3-10 provides the Richter Scale. The Weston MA Observatory of Boston College tracks earthquake activity throughout New England and reports that recent earthquakes in the vicinity of this region, including an April 1996, 3.5 magnitude in Swansea; a July 11, 2002, 3.0 magnitude in Martha's Vineyard; a February 23, 2004, 2.0 magnitude in Dartmouth; a June 12, 2009, 2.5 magnitude in Nantucket; and a June 12, 2011, 2.8 offshore of Nantucket.

The map C-8, *Earthquake Incidence,* indicates that there were three recorded earthquakes in New Bedford for the period 1989 - 2014. As shown on map C-8, there were multiple earthquakes between 1.0 and 2.8 in New Bedford and the surrounding area during the period of 1991-2014. Also indicated on map C-8 is New Bedford's classification within Peak Ground Acceleration (PGA) zones. The entire community falls within the 1-3% PGA classified as "light shaking, no damage". The PGA zones are

[22] 2013 State Hazard Mitigation Plan, p 445.

based on modeling data that indicates areas where there is a 10% chance in the next fifty years of an earthquake exceeding the PGA for that zone. PGA is a measurement that compares the shaking of the ground with the force of gravity. While the likelihood of a powerful earthquake in the region is low, the actual risk is high because of how old the buildings are and because few structures have been built to withstand earthquakes. Critical infrastructure such as bridges and dams would be vulnerable. Overall the likelihood of a geological hazard in the region is considered to be possible but the type of event would be such that the impacts would be small and the severity negligible**,** because earthquakes in the area are typically very small**.**

Table 3-10
Richter Scale

Richter Magnitude	*Earthquake Effects*
2.5 or Less	Recorded on local seismographs, but generally not felt
2.5 – 5.4	Often felt, causes minor damage
5.5 – 6.0	Slight damage to buildings and other structures
6.1 – 6.9	Damage to poorly constructed buildings and other structures within 10's km, may cause a lot of damage in very populated areas
7.0 – 7.9	Major earthquake, serious damage
8.0 - greater	Great earthquake, can totally destroy communities near the epicenter

3.4.2 Landslides

Landslides are often caused by other natural hazards, such as earthquakes, heavy rain, floods, and wildfires. Landslides are more likely during of periods of higher than average rainfall because the ground becomes saturated. Variables that influence landslides include soil properties, topography, slope and historical incidence. New Bedford has been identified in the Massachusetts 2013 State Hazard Mitigation Plan as having a low incidence/low susceptibility of landslides. Thus, landslides are possible, but the impact area is small and the severity is negligible.

3.4.3 Tsunami

A tsunami is a series of ocean waves, typically caused by movement in the ocean floor generated by seismic or volcanic activity or by underwater landslides. All coastal areas of Massachusetts are at risk for a tsunami; however, the frequency of such an event is very low[23]. The U.S. Atlantic coast has experienced very low tsunamis in the last 200 years[24]. Thus, while the frequency is low, the impacts can be high. For the Massachusetts 2013 State Hazard Mitigation Plan, the State assumed a one-mile buffer from the coastline to define the area exposed to the tsunami hazard. The State estimates the population exposed to the tsunami hazard in Bristol County to be approximately 222,000. The populations most vulnerable to a tsunami are the elderly, disabled, and very young who reside in low-lying coastal areas. Therefore, a tsunami is unlikely and the area impacted relatively small, but the severity would be critical, based on Table 3-2.

[23] 2013 State Hazard Mitigation Plan, P. 150
[24] 2013 State Hazard Mitigation Plan, P. 478

3.5 Extreme Temperatures

New Bedford experiences periodic times of extreme temperatures hot and cold. Extreme heat in this region is generally defined as a period of three or more consecutive days above 90°F, typically accompanied by high humidity. Extreme cold events occur when temperatures are well below normal in the area. Winds during extreme cold events create a wind chill. Since 1994, there have been 19 cold weather events in Massachusetts, while there have been 43 warm weather events since 1995.

During periods of extreme cold, staying warm can become a challenge, especially for vulnerable populations. Extremely cold temperatures often accompany a winter storm, which may cause power failures. Therefore some homes become too cold due to power failures and inadequate heating systems. Lower income populations may not have the financial ability to pay for heat and compensate by using space heaters and fire places to stay warm, which increases the risk of fire and carbon monoxide poisoning. Exposure to cold can cause life-threatening health problems, particularly for infants and the elderly. Extended cold temperatures can cause saltwater freezing in coastal bays and harbors. This can interfere with the transportation of goods and people, and other industries reliant on boats.

Extreme cold temperatures are measured through the Wind Chill Temperature Index. The National Weather Service (NWS) issues a Wind Chill Advisory if the Wind Chill Index is forecast to range between -15°F to -24°F for at least 3 hours. A Wind Chill Warning is issued when the Wind Chill Index is forecast to fall below -25°F for at least 3 hours.

A heat wave is defined as 3 or more days with temperatures above 90°F. The NWS issues a Heat Advisory when the Heat Index is forecast to reach 100 to 104°F for 2 or more hours. The NWS issues an Excessive Heat Warning if the Heat Index is forecast to reach over 105°F for 2 or more hours. During periods of extreme heat air quality can deteriorate. In Massachusetts, ground-level ozone and airborne particles are the pollutants that trigger air quality alerts during periods of extreme heat.

In 2011, 206 people nationally died as a result of extreme heat[25]. In 2011, the most dangerous place for extreme heat was in a home with little or no air conditioning. Typically, the elderly is the group most affected by heat. People susceptible to extreme heat can suffer from dehydration, heat exhaustion, and heat stroke. Air-conditioning is the primary protective measure for heat-related illness and death.

Populations most vulnerable to extreme temperatures include the elderly due to age, health conditions and limited mobility; infant and children up to 4 years old; individuals who are physically ill; low-income people who cannot afford proper heating and cooling; and people who overexert during extreme temperatures or experience hypothermia during cold weather.

Based on Table 3-2, the likelihood of extreme temperatures in the region is considered to be highly likely and the impacts would be large and the severity negligible**.**

[25] source: 2013 State Hazard Mitigation Plan, page 421

3.6 Economic Impact

This section provides an overview of New Bedford's vulnerability to the various natural hazards described earlier in this section. This section outlines the most likely source of damage and provides an estimate of damages that may result from these natural hazards. To assess the economic impact for some natural hazards, Chapter 4 in FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses* (August 1, 2001) was used for guidance. This section assesses the potential economic impact of the natural hazards on New Bedford's economy.

To estimate potential economic impacts, property value information from the Tax Assessor's database was obtained. For hazards affecting a limited area, only those structures located within the hazard-prone area were considered, while for hazards that affect the entire City, all structures within the City were considered in the estimate of losses. Table 3-11 summarizes the property values by zoning type for Fiscal Year 2014. This table does not include the value of personal property within these structures or infrastructure. Total value of all properties in the City is $9,774,658,000 (25,753 properties).

Table 3-11
Property Values within New Bedford (FY2014)

Zoning District	*Number of Properties*	*Total Building Value*	*Total Land Value*	*Total Value (Building, Land, Other)*
Residence A District	8,440	$3,226,427,200	$1,180,880,200	$4,407,307,400
Residence B District	9,029	$1,048,615,400	$729,254,600	$1,777,870,000
Residence C District	3,279	$635,799,000	$294,090,200	$929,889,200
Mixed Use Business District	3,793	$1,122,678,800	$594,548,000	$1,717,226,800
Industrial A District	464	$136,183,300	$84,711,700	$220,895,000
Industrial B District	562	$294,688,700	$171,178,200	$465,866,900
Industrial C District	76	$59,264,600	$23,876,900	$83,141,500
Waterfront Industrial District	110	$115,790,500	$56,670,700	$172,461,200
Total	**25,753**	**$6,639,447,500**	**$3,135,210,500**	**$9,774,658,000**

3.6.1 Hurricanes/Tropical Storms

To estimate damage associated with hurricanes and tropical storms, damages associated with flooding and wind were considered within the inundation zones, while damages associated with winds were considered for areas outside of the inundation zone. For damages within the inundation zone, it was assumed an average of 10% and 25% of the structures are damaged for Category 1/2 and Category 3/4 hurricanes, respectively. Wind damage outside the inundation zone was assumed to vary between 0.125% and 1% of the structures. Total damages are estimated in Table 3-12.

Table 3-12
Total Estimated Damages for Hurricanes

Storm	*% Property Damage within Inundation Zone*	*Total Damage within Inundation Zone*	*% Property Damage outside Inundation Zone*	*Total Damage outside Inundation Zone*	*Overall Total Damage*
Category 1	10%	$64,469,000	0.125%	$11,412,000	$75,881,000
Category 2	10%	$70,203,000	0.25%	$22,682,000	$92,885,000
Category 3	25%	$370,668,000	0.5%	$41,460,000	$412,128,000
Category 4	25%	$507,354,000	1.0%	$77,452,000	$584,806,000

3.6.2 Nor'easters

Nor'easters include heavy rains, wind and, at times, flooding. Under a worst-case scenario, a Nor'easter can result in damage similar to a Category 1 hurricane. Therefore, based on Table 3-13, the total potential damage associated with a Nor'easter is $75,881,000.

3.6.3 Winter Storms and Blizzards

A blizzard can result in structural damage to properties from the winds and weight of snow; however, unlike Nor'easters, flooding may not occur. Therefore, under a worst-case scenario, damages would likely not be as severe as a Category 1 hurricane. It was assumed that total economic losses could be 50% of the total damage outside the inundation zone for a Category 1 hurricane, approximately $6,000,000.

3.6.4 Thunderstorms

Thunderstorms affect localized areas, compared to winter storms and hurricanes, but can produce significant rainfall in a short period of time, damaging winds, hail and cause fires due to lightning strikes. Because the damage is localized, the property damage from a severe thunderstorm would likely not exceed $1,000,000.

3.6.5 Coastal and Riverine Flooding

To estimate damages to properties potentially subject to flooding, the FEMA 100-year floodplain map was overlain with the parcel maps from the Tax Assessor's office. For structures within the flood-prone area, three levels of severity were considered, based on guidance from Chapter 4 in FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses*, as shown on Table 3-13.

Table 3-13
Total Estimated Damages for Flooding

Flooding Depth	*% of Property Damaged*	*Total Damage*
1 to 4 ft	10%	$106,440,800
4 to 8 ft	25%	$266,102,000
> 8 ft	50%	$532,204,000

3.6.6 Dam Failures

New Bedford Reservoir Dam is located in Acushnet, and of the four dams owned by New Bedford, is the only dam with the highest hazard code of "high." Inundation maps from the dam to the Acushnet River were developed from a dam breach study. In Acushnet and New Bedford, there are 120 properties within the inundation zone with a total property value of $89,000,000. Assuming 25% of the properties are damaged with a flooding depth of 1 to 4 ft, the estimated total losses are $22,000,000. Because this is a high hazard dam, it was assumed that a dam failure by the lower hazard dams would most likely not exceed this value.

3.6.7 Tornados/Waterspouts

Most of the tornados in New Bedford have been historically classified as F0 and F1 tornados. Tornado records for Massachusetts indicate that the widest tornado recorded in the state was 1000 yards with a path generally less than 1 mile[26]. A worst case scenario for the City assumed a 1000-yard-wide tornado with a one mile path, originating at the waterfront near School Street and traveling westward. It was assumed that all properties located within the inner 300 yard width of the `tornado would be completely destroyed, and, of the remaining properties within the tornado's path, 25% of the properties would be destroyed. Based on this assumption, the estimated property damage caused by a tornado could be up to $445,000,000.

3.6.8 Wildfires

As stated earlier, woodland areas with pitch pine/scrub oak vegetation is highly flammable. To estimate potential losses associated with a wildfire, a worst-case scenario was assumed in which 50% of the properties located within the pitch pine/scrub pine areas (as shown on Map C-7) are destroyed, resulting in $265,418,000 in damage.

3.6.9 Drought

Drought affects mainly agricultural production and large uses of water, such as golf courses. New Bedford has not experienced a major drought or instituted a water ban. Droughts are usually of relatively short duration, and therefore little or no damaging impacts are anticipated.

3.6.10 Earthquakes

Because earthquakes are rare in New Bedford, most structures were not constructed to withstand earthquakes. Historically, most of the earthquakes have been minor, causing no damage. According to the 2013 State Hazard Mitigation Plan[27], damage caused by an earthquake will commence at 0.1 g (10% PGA). Damage at this level of earthquake ranges from plaster cracking to moderate damage of poorly constructed structures. The 2013 State Hazard Mitigation Plan estimates the probability of an earthquake of this magnitude occurring once every 2,476 years (approximately 5.0 on the Richter Scale). Based on guidance from Chapter 4 in FEMA's *Understanding Your Risks: Identifying Hazards and Estimating Losses,* 2% of all properties would be damaged at 0.1 g, assuming a worst-case scenario for unreinforced masonry construction. The total loss is estimated to be $195,493,000.

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[26] http://www.tornadohistoryproject.com/tornado/Massachusetts/map

[27] 2013 State Hazard Mitigation Plan, p 235.

3.6.11 Landslides

Since New Bedford has a low incidence/low susceptibility to landslides, damage from a landslide will be minimal. If a landslide were to occur, that total losses would likely be less than $500,000.

3.6.12 Tsunamis

The State Hazard Mitigation Plan assumed an area of impact one mile inland from the coastline. For New Bedford, this area can be approximated as the area inundated by a Category 4 hurricane. Assuming 25% of the properties are destroyed, the total damage associated with a tsunami is $507,000,000.

3.6.13 Extreme Temperatures

Extreme heat and cold have occurred numerous times in New Bedford since 1994. While extreme temperatures can have an impact on vulnerable populations, extreme temperatures have a short duration and result in little to no damage of properties.

Section 4
Hazard Mitigation Measures

The City of New Bedford has implemented numerous hazard mitigation measures to address potential disaster situations. As shown in Table 4-1, these measures are a mixture of capital improvements, regulations, planning activities and education.

Table 4-1
Existing Protection Matrix: City of New Bedford

Category of Protection Measure	*Description*	*Area Covered*	*Effectiveness and/or Enforcement*	*Improvements or Changes Needed*
Capital Improvement Planning/ Structural Improvements	Pump station repairs and improvements to wastewater system over the past 5 years using $500,000 from operating funds.	City-wide	Effective	None – part of regular maintenance program
	Hurricane Barrier maintenance including painting gates and testing pumps, and investment in back-up generation in 2014 undertaken by the Wastewater Division of the City's Department of Public Works.	Hurricane Barrier	Effective	None – regular maintenance is performed.
	HMGP funds used in 1991 to equip pump stations with back-up generators in order to maintain essential services.	City-wide	Effective	None
	Capital Improvement Planning is completed on a two year cycle. Departments submit requests for capital items.	City-wide	Effective	There are very limited funds for capital projects. Sometimes there are funds left at year's end that can be used for these items.
Regulations/ Ordinances/Codes	Floodplain Zoning Art. II, Div. 12 Sect 9-320	NFIP Maps	Effective	Regular training helps.
	Site Plan Review Art. III Sect 9-331	Project Thresholds-City-wide	Effective – Planning Board is SPGA	Training for new Board members and existing members on technical and changing aspects of reviews.
	Floodplain Overlay District, Section 9-4400 in Code of Ordinances	NFIP Maps	Effective	Updated when NFIP maps are updated. Most recent update was June 2014.
	Subdivision Rules Require Underground Utilities	City-wide	Planning Board enforces	None

Category of Protection Measure	*Description*	*Area Covered*	*Effectiveness and/or Enforcement*	*Improvements or Changes Needed*
Operations, Administration and Enforcement	Trimming of Tree limbs in street right-of-way	City-wide	Forestry Division of the Department of Public Facilities completes this as possible after responding to priority needs.	Additional manpower would ensure regular completion.
	Disaster Warning System consists of the use of Cable TV and local AM radio broadcast.	City-wide	Does not guarantee a means to reach everyone.	Additional measures, such as siren system should be explored.
Planning	Comprehensive Plan Update underway	City-wide	Underway	Opportunity to integrate disaster mitigation into the plan.
	Open Space Plan	City-wide	Completed in 2000	Addresses value of wetlands including restoring degraded natural resources; developing greenways; and preserving the Acushnet Cedar Swamp.
Education & Training	32 volunteers completed CERT training in spring 2004.	City-wide	Effective	Expand and enhance these efforts by connecting into the Homeland Security initiatives for Citizens Corps programs.
	General Presentations and hosting of events by the EMA Director (e.g. National Hurricane Center hurricane plane at the New Bedford Airport)	City-wide	Effective	Could always do more.

In addition, the City has developed evacuation maps that are used during emergency situations. These maps are provided in Appendix D.

Section 5
Proposed Disaster Mitigation Actions

5.1 Goal Statements

New Bedford has developed the following hazard mitigation goals:

- Prevent and reduce the loss of life, property, infrastructure, and cultural resources resulting from natural hazards.
- Identify and seek funding mechanisms to address proposed mitigation actions.
- Integrate hazard mitigation planning into relevant municipal departments and boards planning efforts.
- Collaborate with surrounding communities, state, regional, and federal agencies to ensure cooperation for natural hazards that affect multiple communities.
- Ensure that future development is compliant with federal, state, and local regulations in order to reduce the impacts of natural hazards.

5.2 Proposed Mitigation Actions

The City of New Bedford has proposed several mitigation actions to reduce the impact of natural disasters. This section provides a description of these proposed actions, summarized by City department.

5.2.1 Emergency Management Department

5.2.1.1 Purchase and Install Auxiliary Generators

The City proposes to purchase and install auxiliary generators for critical local government department operations centers at the following locations:

(a) Health Department – 1213 Purchase Street

(b) Emergency Management Department – 834 Kempton Street

(c) DPI Complex – 1105 Shawmut Avenue

(d) Emergency Medical Services Department – 181 Hillman Street

Engineering and planning services will determine each facility's individual power needs. Appropriate generators and fuel containment facilities will be installed at each location thereafter.

5.2.1.2 Improve Warning Capabilities

The City proposes to improve the City's emergency warning capabilities through the purchase of a "Reverse 911" geo-based telephone notification service. Training of appropriate E911 Center personnel in the use of this system will be required for the system to reach full functionality.

Education activities will be held to educate the public on the City's use of the system and promote "opt-in" for residents' cellular or Voice Over Internet Protocol (VoIP) phones.

5.2.1.3 Special Needs Registry

The City proposes to update its "Special Needs Registry" and promote voluntary registration (or participation) by residents who may require additional assistance, transportation, and/or sheltering in the event of a major emergency or disaster. The program will be implemented within the next calendar year and will be continually carried out via the following action items:

(a) Conduct community outreach efforts to encourage persons with access and functional needs to register.

(b) Provide specialized, pre-disaster emergency information to this population.

(c) Update and maintain registry database for use in emergency situations.

5.2.1.4 Community Preparedness Outreach/Messaging Efforts

The City proposes to improve community preparedness and outreach by implementing the following action items:

(a) Distribute all-hazard and hazard-specific disaster safety information through various media.

(b) Continue "Know Your Zone" outreach efforts to residents in hurricane evacuation areas.

(c) Develop disaster education programs for specific vulnerable populations.

(d) Make locally-developed disaster preparedness material available in multiple languages.

5.2.1.5 Community Rating System Participation

Over the next several years the City will be exploring participation in the federal Community Rating System (CRS) program. Staff will evaluate program requirements, review existing activities eligible for program "credits" and explore potential activities that could be initiated and/or implemented to secure additionally needed "credits" to secure a CRS rating classification. Participation in this program will allow a discount in flood insurance premium rates, which reflect the reduced flood risk as a result of meeting the goals of the CRS program.

5.2.1.6 Debris Management Plan

The City proposes to develop a Debris Management and Monitoring Plan. The plan will address the collection, monitoring and disposal of debris after a storm event. Development of such a plan will enhance the City's efforts to secure reimbursement under FEMA's Public Assistance Program in a declared disaster for debris removal operations.

5.2.2 Police Department

5.2.2.1 New Roof for Police Station #1

The roof for Police Station #1 is aging and in need of repairs. Accordingly, the City proposes to install a new roof at Police Station #1 over the next two years. Having a new roof will mitigate potential structural damage during a natural disaster.

5.2.2.2 New Parking Lot Drainage System at Police Headquarters

The parking lot at Police Headquarters is subject to localized flooding during heavy precipitation events. The City is proposing to install new drainage system in the parking lot. Alleviating the flooding will allow the Police Department to better respond to disaster events.

5.2.2.3 New Communications Systems

The technology currently used by emergency personnel at the City's Emergency Radio Broadcast Towers is aging. To address this aging infrastructure, new radio antenna repeaters and satellite receivers, including any associated battery backup systems, are proposed to aid emergency personnel during natural disasters.

5.2.3 Fire Department

5.2.3.1 Emergency Generators for Radio Transmitters

The main radio transmitters for the New Bedford Fire Department and the New Bedford Police Department located at the Regency Towers are not supported by the emergency generator. The generator at this facility is currently at capacity with a battery backup in place that has limited duration. To address this adverse weather public safety infrastructure problem, the City proposes to add a generator to the radio room or relocate the radio equipment to the New Bedford Hotel, which does have generator capacity available.

5.2.3.2 Upgrade of Fire Alarm System

The present fire alarm system uses wire-based technology, which is subject to damage every time there is moderately severe weather. Upgrading of the system to a wireless-based system would address this problem. It will require the upgrading of all municipal buildings to this new technology. With 80 buildings and an average cost of $10,000 per unit, the cost will be $800,000 for the full program.

5.2.3.3 Replace/Renovate Existing Fire Stations

The fire stations in the City have an average age of 102 years of age with the newest having been constructed in the early 1950's. None of these buildings were constructed to seismic standards and are of unreinforced masonry. These types of buildings are the most prone to catastrophic failure in the event of a seismic event. This would result in the possible complete loss of fire protection during a moderate event. In addition, these structures located throughout the City would be logical locations for mass care facilities in the event of a catastrophic event. At present none of our buildings have this capability in their design and this should be a future consideration.

5.2.3.4 EMT Training for Fire Department Members

The New Bedford Fire Department has 230 uniform members who are currently medically trained to the first responder level. The concept of a citizen's emergency response team has not had the impact that was anticipated. By providing EMT training to the members of the New Bedford Fire Department, the City would be able to increase the level of services provided to the citizens in the aftermath of a catastrophic event. This would also have a positive impact on day to day operations as medical responses account for over 60 percent of emergency calls. By using the New Bedford Fire Department in this way, the City would have the ability to have a surge capacity of EMT trained personnel for major events.

5.2.3.5 Stockpile Supplies for Operations Crews and Local Population

The City's emergency services, police, fire, EMS, DPI, DFFM and others, must be able to sustain operations continuously from the onset of the disaster until outside help arrives during a major natural disaster. When a major natural disaster occurs, outside help will frequently not be available for 72 hrs at a minimum. For widespread events, such as hurricanes and earthquakes, when the local infrastructure no longer functions, it can take longer for that help to be effective. From a service continuation standpoint, the ability of emergency service agencies to operate beyond 24 hours begins to deteriorate when there is a lack of food, potable water and fuel. Thus, the City proposes to stage large supplies of water and meals-ready-to-eat to be available to sustain operations crews. These supplies will also be available to support the local population at mass care shelters if needed. With the extended shelf life of these supplies, they are a long term investment. This mitigation action will include a study to find an appropriate location for this facility.

5.2.4 Planning Department

5.2.4.1 Study Rezoning of South End of City

On average, the first 500-feet inland from the coast is vulnerable to flooding because it is not protected by the hurricane barrier. To minimize the amount residents and property are put at risk during a hurricane, the City proposes to examine the feasibility of downzoning the portions of the peninsula that are Residence B (two-family) to Residence A (single-family), potentially, decreasing the density of the area. Over the next three to five years the Planning Department will seek to understand the potential risk to the south end and rezone areas that may be significantly susceptible during a hurricane.

5.2.4.2 Adopt Stormwater Ordinance

The Planning Department is currently drafting an updated stormwater ordinance and stormwater regulations that address Low Impact Development (LID) to increase the efficiency of stormwater control at the source. The City intends to implement the new ordinance and regulations during the 2015 calendar year.

5.2.4.3 Integrate Disaster Mitigation into Comprehensive Master Plan

The Planning Department intends to integrate disaster mitigation into the next comprehensive master plan for the City. Disaster mitigation will be addressed during all phases of the City's next planning cycle. This will assist the City evaluating future development projects and zoning changes, and in developing new ordinances.

5.2.5 Harbor Development Commission

5.2.5.1 Installation of a Wave Attenuator at Pope's Island Marina

The City is proposing to install a wave attenuator on the southwestern side of Pope's Island Marina. The wave attenuator will help to protect the structures and vessels in the marina during significant storm events.

5.2.5.2 Installation of a Storm Mooring System at Pope's Island

The Environmental Protection Agency is overseeing the dredging of contaminated soils in New Bedford Harbor. These removed soils are buried in a CAD cell field north of Pope's Island. The City is

proposing to install a mooring system in the CAD cell field to protect this area during significant storm events.

5.2.5.3 Repair, Bolster and Expand Commercial Fishing Piers

The City is proposing to repair, bolster and expand the commercial fishing piers in the harbor. These improvements to the commercial fishing piers will allow the piers to secure larger fishing vessels during storm events. Protection of the fishing vessels during storm events will reduce the impact to the fishing industry.

5.2.5.4 Dredge New Bedford Harbor

The City is proposing to dredge all the required areas identified in the Phase V of the Harbor Development Commission's dredging project. This project will permanently open up new berths within the Hurricane Barrier for commercial and recreational vessels, which will allow these vessels to be protected during storm events.

5.2.5.5 Expansion of Pope's Island Marina

The City is proposing to expand Pope's Island Marina to create more berths for recreational vessels. Expansion of the marina will allow these vessels to be protected during storm events.

5.2.5.6 Replacement of Mooring Anchors and Gear

The City is proposing to replace all the existing mooring anchors to a helix-style and replace all the gear to hazelett-style. Replacing these fixtures will make them more resistant to storms.

5.2.5.7 Fund Unified Command Center for Local, State and Federal Emergency Response Agencies

The City is proposing to fund a Unified Command Center for local, state and federal emergency response agencies. During natural disasters this center will be activated and used to coordinate the City's response to the natural disaster.

5.2.5.8 Assess and Mitigate Utility and Infrastructure Weaknesses on the Waterfront

The City is proposing to conduct an assessment of the utilities and infrastructure on the waterfront to identify any weaknesses. Based on this assessment, the City will implement mitigate measures to address any deficiencies that are identified.

5.2.6 Department of Public Infrastructure

5.2.6.1 Install New SCADA System at Sewer Pump Stations

The City will continue to expand the installation program of new SCADA systems within pumping stations to ensure remote monitoring of all stations in the event of a disaster. This improved system will also eliminate the potential for prolonged system failures that result in flooding.

5.2.6.2 Clarks Cove Pump Station and Hurricane Barrier Localized Flooding Improvements

Inadequately sized sewer and stormwater drainage systems cause localized flooding near Clarks Cove Pump Station and near the Hurricane Barrier. Therefore, in conjunction with the Army Corps of Engineers, the City will undertake further improvements to the Clarks Cove Pump Station, to low-lying areas near the Hurricane Barrier, and to the sewer and stormwater drainage systems.

5.2.6.3 Flood-proof Sewer Pump Stations within Flood-prone Areas

The City proposes to complete flood-proofing the wastewater and flood control pump stations, and the emergency power facilities located within the FEMA 100-year floodplain boundary. Upgrading these facilities will ensure that critical wastewater facilities continue to operate during natural disaster events.

5.2.6.4 Coggeshall Street Area Stormwater Drainage Improvements

The City is working to complete stormwater drainage system improvements projects in the Coggeshall Street, Sawyer Street, Deane Street, Logan Street, Purchase Street, Belleville Avenue, and Acushnet Avenue areas in order to increase stormwater drainage capacity in these streets. These measures will mitigate or eliminate localized flooding problems and aid in drainage capacity during disaster events.

5.2.6.5 Maple and Chancery Streets Stormwater Drainage Improvements

The City is proposing to undertake drainage infrastructure improvements to address localized street flooding in the vicinity of Maple and Chancery Streets. These improvements would also address capacity problems in the stormwater drainage and sewer systems in this area.

5.2.6.6 Page Street Stormwater Drainage Improvements at St. Luke's Hospital

The City is proposing to undertake stormwater drainage system improvements to address flooding issues at Page Street, near St. Luke's Hospital. Addressing flood problems in this area will help to ensure access to the hospital during natural disasters.

5.2.6.7 Buttonwood Park Pond and Dam Improvements

The City is proposing to undertake improvements to the Buttonwood Park Pond and Dam and conveyance structures downstream to address overtopping during storm events. Mitigation of overtopping will alleviate flooding in surrounding areas.

5.2.6.8 Pearl Street Stormwater Drainage Improvements

The City is proposing to undertake stormwater drainage system improvements to address street flooding within Route 18, Hillman Street, Pearl Street, and at the intersection of Acushnet Avenue and Pearl Street in the vicinity of the Railyard, Division of Career Services, and Whale's Tooth Parking Lot. Stormwater drainage system improvements in these areas will help to provide continued access to these roads during natural disaster events.

5.2.6.9 Brownell Avenue and Hawthorne Street Stormwater Drainage Improvements

The City will undertake stormwater drainage system improvements to address localized flooding in the area of Brownell Avenue and Hawthorne Street and conveyance structures downstream during major precipitation events. Addressing localized flooding in this area will help mitigate flooding impacts during natural disaster events.

5.2.6.10 New Bedford Reservoir Dam and Turner's Pond Dam Improvements

The City will undertake improvements at the New Bedford Reservoir Dam and Turner's Pond Dam. These improvements will address deficiencies identified at these dams and will help to ensure that these dams remain stable during significant precipitation and disaster events.

5.2.6.11 Establish "Micro-Grid" within City for Auxiliary Power

The City proposes to establish "micro-grids" within key City locations for auxiliary power. These "micro-grids" will mitigate power outages during disaster events, enabling the City to respond to emergency situations in a timely and more efficient manner.

5.2.6.12 Route 18 and Wamsutta Avenue Stormwater Drainage Improvements

The City will undertake stormwater drainage system improvements to address flooding at the intersections of Route 18 and Wamsutta Street, Wamsutta Street and North Front Street, Wamsutta Street and Acushnet Avenue, and at the Wamsutta Street Pump Station. Improvement of the drainage capacity in these areas will alleviate flooding during heavy precipitation and natural disaster events and help to ensure continued access to these roads during a disaster event.

5.2.6.13 Sheffield Street/ Stratford Street Stormwater Drainage Improvements

The City is proposing to correct localized flooding problems associated with an unnamed stream to the east of Acushnet Avenue. Flooding generally occurs in the area of Sheffield Street, southerly to Stratford Street and in the downstream portion of the City's 027 drain system in the northern part of the City. Addressing flooding this area by improving the stormwater drainage system will help to ensure continued access to these roads during a disaster.

5.2.6.14 Drainage Improvements from Tarkiln Hill Road to Nash Road Pond

The Copper Brook drain system was originally constructed as a water supply for Revere Copper located within New Bedford, conveying water from the Nash Road Pond to the Copper Brook Pond at the mills. The drain is a patchwork of various pipe diameters, materials and ages; some of which consists of stone blocks and granite rubble. The drain traverses some of the busiest streets in the City, crosses under both Route 18 and Route 195 before discharging to the Copper Brook Pond. The pond overflows to a stream located adjacent to Wamsutta Street and eventually to the Acushnet River. The drain and pond systems have historically been susceptible to flooding during wet weather events due to inadequate capacity and the condition of the pipe. Under heavy rainfall events, the Nash Road Pond overtops and floods Nash Road, making it impassable. Most recently, a section of the Copper Brook pipe partially collapsed within Acushnet Avenue, one of the City's busiest streets. In addition, there are direct overflow points from the drain to the City's sewer system contributing to the City's combined sewer overflow (CSO) problem. The pond and stream at the downstream end of Copper Brook create a bottleneck for water to flow to the Acushnet River. Therefore, both the pond and stream need to be addressed as part of the overall solution to mitigate flooding resulting from the brook. This project will be coordinated with flooding that occurs at Wamsutta Street and Route 18, as both flooding areas result from issues with the Copper Brook system and Wamsutta Street stream.

5.2.6.15 West End CSO Separation Contract Phase IV

Phase IV of the West End CSO Separation project consists of constructing the main intercepting drain (7,600-feet) for the separation of approximately 12,500-feet of combined sewer in the West End Sewer Separation – Phase V portion of the program. This portion is the fourth phase of sewer separation in the West End area of New Bedford. Construction of Phase I was completed in 2001 and the construction of Phase II and III was completed in the summer of 2006. In addition to reducing CSO discharges to Clarks Cove, the Phase IV Sewer Separation will discharge stormwater from the project area to the Inner Harbor. This is important because the removal of stormwater, in addition to the

reduction in CSOs, is required to attain maximum use of the shellfish beds in Clarks Cove. The project also provides the main trunk drain to address critical flooding areas at the intersection of Maple Street and Chancery Street, as well as the western portion of St. Luke's Hospital.

5.2.6.16 West End CSO Separation Contract Phase V

Phase V of the West End CSO Separation project consists of separating approximately 12,500-feet of combined sewer in the West End area of New Bedford. The Phase V sewer separation is the fifth phase of sewer separation in the City's West End. The West End Sewer Separation – Phase IV portion of the project will provide the main intercepting drain for this portion of the program and has been described in Section 5.2.6.15. As is the case with the Phase IV Sewer Separation project, the Phase V portion of the program will also reduce CSO discharges to Clarks Cove by separating the combined sewer system. Stormwater from the project area will be discharged to the Inner Harbor, helping to attain maximum use of the shellfish beds in Clarks Cove. In addition to reducing CSO's, Phase V sewer separation will also provide the sideline drains required to mitigate sewer system flooding at the intersection of Maple and Chancery Streets and along the western portion of St. Luke's Hospital that occurs due to wet weather. This will address a public health issue and safety issue that occur.

5.2.6.17 Assawompsett Dam Improvements

The City is proposing to undertake improvements to the Assawompsett Dam and associated downstream conveyance facilities. These improvements will repair any defects with the dam and ensure that the downstream conveyance systems will have adequate capacity during heavy precipitation and disaster events.

5.2.6.18 Improve the Inter-Municipal Agreement with Taunton for Assowompsett Dam

The City will pursue the development of a clearer agreement between the City of Taunton and the City of New Bedford on the ownership, maintenance, and control of the Assawompsett Dam. Restructuring this contract will provide each party with a clear understanding of their responsibilities regarding dam operations and expedite procedures during disaster events.

5.2.6.19 Improve Communications and Data Gathering for Infrastructure Systems

The City will continue in its pursuit to purchase and upgrade equipment required to implement asset management strategies, improvements in communication and data gathering in the field. These technologies will meet Administrative Order and CMOM program requirements, and ensure proper operation and maintenance of the City's stormwater, flood protection, and sewer systems.

5.2.6.20 Implement Snow Plowing Tracking System

The City will work to implement a snow plow tracking system to more efficiently clear City streets during snow events. This plan will be based on GPS and GIS technologies that will enable staff to efficiently route plows throughout the City.

5.3 Priority Ranking of Proposed Mitigation Actions

To identify, evaluate, and prioritize proposed mitigation actions, the City used the STAPLEE method developed by FEMA. Appendix E provides the STAPLEE worksheets that were used to develop the priority listing of the proposed mitigation actions. The STAPLEE method uses the following criteria to assess proposed mitigation actions:

- **S**ocial – Assesses whether it will be socially accepted within the community.
- **T**echnical – Assesses whether it will be technically feasible and whether it will help to reduce losses in the long term.
- **A**dministrative – Assesses the community's capabilities for carrying out the projects.
- **P**olitical – Assesses local and state political support for the project.
- **L**egal – Assesses whether state and local laws will allow for implementation of the project.
- **E**conomic – Assesses the cost-effectiveness and sources of funding for the project.
- **E**nvironmental – Assesses how the project will affect the environment.

Table 5-1 summarizes the proposed mitigation actions for New Bedford. These mitigation actions were prioritized as either "high", "medium" or "low" priority based on the STAPLEE evaluation. Many of these activities will require grant funding, others will require the cooperation of other agencies and local communities. The City of New Bedford will make a good faith effort to implement these actions within the constraints of the local budget, staff resources, and new demands from state and federal agencies.

5.4 National Flood Insurance Program

The City participates in FEMA's National Flood Insurance Program (NFIP). Periodically, FIRMs are revised to reflect current conditions in the floodplains. FEMA reissued the FIRMs for the City of New Bedford, with an effective date of July 16, 2014. Prior to the effective date, the City Council voted to adopt the new FIRMs.

In addition, the City has a Floodplain Overlay District, which includes all special flood hazard areas within the City of New Bedford designated as Zone A, AE, or VE on the Bristol County Flood Insurance Rate Map (FIRM) issued by FEMA for the administration of the NFIP. This district is regulated under the zoning ordinances and is updated based on the latest FIRMs. It was most recently updated on June 16, 2014 to reflect the reissued FIRMs for the City.

Table 5-1
Proposed Mitigation Actions: City of New Bedford

Objective	*Action*	*Responsible Parties*	*Timeline*	*Resources Needed*
High Priority Mitigation Actions				
Capital and Structural Improvements	Install a new SCADA system within pumping stations	Dept. Public Infrastructure	Two (2) years	Funding for engineering study, permitting, and design, as well as, improvements.
Improve Operations, Administration, and Enforcement	Develop a Debris Management and Monitoring Plan. Plan will deal with the collecting, monitoring and disposal of debris after a storm event and will enhance city's efforts to secure reimbursement under FEMA's Public Assistance Program in a declared disaster for debris removal operations	Emergency Mgt. Division, Dept. Facilities and Fleet Mgt., Dept. Public Infrastructure	Two (2) years	Staff time to develop and implement plan; conduct necessary training/orientation; and to exercise plan.
Capital and Structural Improvements	Undertake drainage improvements to address localized flooding at the Clarks Cove Pump Station and Hurricane Barrier area.	Dept. Public Infrastructure and Army Corps of Engineers (ACOE)	Three (3) years	Funding for planning, design, permitting and construction.
Integrate disaster mitigation into ongoing planning efforts.	Update Pre-Disaster Mitigation Plan at least every 5 years, or as needed and monitor progress.	Emergency Mgt. Agency	Every five (5) years	Funding to update plan every five (5) years.
Undertake Capital and Structural Improvements to achieve disaster mitigation.	Repair, bolster and expand commercial fishing piers to be able to withstand larger fishing vessels during storm events.	Harbor Development Commission	Two (2) to three (3) years	Funding for planning, design, permitting and construction.
Improve Operations, Administration, and Enforcement	Update City's "Special Needs Registry" and promote voluntary registration (or participation) by residents who may require additional assistance, transportation and/or sheltering in the event of a major emergency or disaster. Conduct community outreach efforts to encourage persons with access and functional needs to register. Provide specialized, pre-disaster emergency information to this population. Update and maintain registry database for use in emergency situations.	Emergency Mgt. Division, Health Dept., Community Services Dept., Emergency Medical Services Dept., Commission for Citizens with Disabilities, Community Groups	One (1) year and ongoing.	Staff time to promote program, screen Registry applications and to perform database entry and maintenance.

Objective	*Action*	*Responsible Parties*	*Timeline*	*Resources Needed*
Improve Operations, Administration, and Enforcement	Explore city participation in the federal Community Rating System (CRS) Program.	Dept. Public Infrastructure, Inspectional Services Dept., Environmental Stewardship Dept., Emergency Mgt. Agency	Three (3) years	Staff time to evaluate program requirements, review existing activities eligible for program "credits" and explore potential activities that could be initiated/implemented to secure additionally needed "credits" to secure a CRS rating classification.
Education and training programs.	Expand community preparedness outreach and messaging efforts Distribute all-hazard and hazard-specific disaster safety information through various means. Continue "Know Your Zone" outreach efforts to residents in hurricane evacuation areas. Develop disaster education. programs for specific vulnerable populations. Make locally-developed disaster preparedness material available in multiple languages.	Emergency Mgt. Division, Community Services Dept., Health Dept., Cable Access Dept., Public Information Officer	One (1) year and ongoing.	Staff time to implement and continue. Seek funding or pro-bono services for language translation.
Undertake Capital and Structural Improvements to achieve disaster mitigation.	Replace all mooring anchors to helix-style and gear to hazelett style to make them more storm-resistant.	Harbor Development Commission	Two (2) to three (3) years	Funding for planning, design, permitting and construction.
Undertake Capital and Structural Improvements to achieve disaster mitigation.	Dredge all required areas in the HDC's Phase V dredging project, which will open up new berths within the Hurricane Barrier for commercial and recreational vessels permanently including during storm events.	Harbor Development Commission	Two (2) to five (5) years	Funding for planning, design, permitting and construction.
Undertake Capital and Structural Improvements to achieve disaster mitigation.	Install storm mooring system in the CAD cell field north of Pope's Island	Harbor Development Commission	Three (3) to five (5) years	Funding for planning, design, permitting and construction.

Objective	*Action*	*Responsible Parties*	*Timeline*	*Resources Needed*
Undertake Capital and Structural Improvements to achieve disaster mitigation.	Install a wave attenuator on the southwestern side of Pope's Island Marina	Harbor Development Commission	Two (2) to three (3) years	Funding for planning, design, permitting and construction.
Undertake Capital and Structural Improvements to achieve disaster mitigation.	Fund Unified Command Center for Local, State and Federal emergency response agencies.	Harbor Development Commission	Two (2) to three (3) years	Funding for planning, design, permitting and construction.
Capital and Structural Improvements	Purchase and install auxiliary generators for critical local government Department Operations Centers: Health Department – 1213 Purchase Street Emergency Management Department – 834 Kempton Street DPI Complex – 1105 Shawmut Avenue Emergency Medical Services Department – 181 Hillman Street	Dept. of Facilities and Fleet Mgt., Health Dept., Emergency Mgt. Division, Dept. Public Infrastructure, Emergency Medical Services Dept.	As funding sources are identified and funds become available.	Engineering work to determine individual facility power needs; installation and fuel supply requirements. Secure funding for procurement and installation.
Improve Operations, Administration, and Enforcement	Improve the City's emergency warning capabilities through the purchase of "Reverse 911" geo-based telephone notification service. Train appropriate E911 Center personnel in use of same. Conduct public education activities on the city's use of the system and promote "opt-in" for residents' cellular or VoIP phones.	Emergency Mgt. Division, Police Dept., Community Services Dept., Cable Access Dept., Public Information Office	As funding becomes available	Funding for initial procurement of service and recurring annual service fee. Funding for training of appropriate E911 Center personnel. Staff time for public education activities and maintenance of "op-in" database.
Capital and Structural Improvements	Provide auxiliary power to public safety two-way radio communication infrastructure at Regency Towers, 800 Pleasant Street, or relocate radio equipment to New Bedford Hotel.	Fire Dept., Police Dept., Purchasing, Communications Dept., Dept. of Facilities and Fleet Mgt.	One (1) year	Staff time to investigate available options and potential alternate site if required. Identification of funding to provide auxiliary power at existing site or to relocate equipment to new site and make needed modifications at new site.
Capital and Structural Improvements	Flood-proof wastewater and flood control pump stations and emergency power facilities located within the 100-year flood boundary.	Dept. Public Infrastructure	Two (2) years	Funding for engineering study, permitting, and design, as well as, improvements.

Objective	Action	Responsible Parties	Timeline	Resources Needed
Capital and Structural Improvements	Install new roof for Police Station #1.	Police Department	Two (2) years	Funding for engineering/structural permitting and design materials and installation.
Capital and Structural Improvements	Install new drainage system in parking lot to address flooding at Police Headquarters.	Police Department	Two (2) years	Funding for engineering/structural permitting and design materials and installation.
Capital and Structural Improvements	Install new radio antenna repeaters/satellite receivers including battery backup systems.	Police Department	Two (2) years	Funding for engineering/structural permitting and design materials and installation.
Capital and Structural Improvements	Emergency generators for radio transmitters at Regency Towers.	Fire Department	Two (2) years	Funding for engineering, design materials and installation.
Capital and Structural Improvements	Upgrade fire alarm system to a wireless-based system.	Fire Department	Three (3) years	Funding for engineering, design materials and installation.
Capital and Structural Improvements	Renovate/replace existing fire stations to withstand earthquakes and serve as mass care facilities during a catastrophic event.	Fire Department	Five (5) years	Funding for engineering studies, permitting, design, and construction.
Improve Operations, Administration, and Enforcement	Pursuit purchase/upgrade of equipment required to implement asset management strategies, improvements in communication and data gathering in field, meet Administrative Order/CMOM program requirements, and proper operation/maintenance of the City's stormwater, flood protection, and sewer systems.	Dept. Public Infrastructure	Three (3) years	Additional staff to implement program, funding to support staff and purchase of equipment, and engineering costs to support program management.
Improve Operations, Administration, and Enforcement	Implement a snow plow tracking system and GIS system upgrades.	Dept. Public Infrastructure	Two (2) years	Funding for upgrade of City's GIS system and purchase and integration of software package for tracking.
Improve Operations, Administration, and Enforcement	Provide EMT training for New Bedford Fire Department uniform members.	Fire Department	Two (2) years	Staff time to conduct training.

Objective	*Action*	*Responsible Parties*	*Timeline*	*Resources Needed*
Improve Operations, Administration, and Enforcement	Stockpile supplies of water and meals ready-to-eat to sustain operations crews and local populations at mass care shelters during natural disasters.	Fire Department	Five (5) years	Staff time to stock supplies and funding to purchase supplies.
Undertake Capital and Structural Improvements to achieve disaster mitigation.	Assess and mitigate utility and infrastructure weaknesses on the waterfront.	Harbor Development Commission	One (1) to three (3) years	Funding for planning and design.
Medium Priority Mitigation Actions				
Capital and Structural Improvements	Undertake drainage improvements in the Coggeshall Street, Sawyer Street, Deane Street, Logan Street, Purchase Street, Belleville Avenue, and Acushnet Avenue area to eliminate localized flooding problems.	Dept. Public Infrastructure and MassDOT	Two (2) years	Funding needed for design, permitting and construction of improvements.
Capital and Structural Improvements	Undertake drainage improvements in vicinity of Maple Street and Chancery Street to address street flooding and capacity problems in the storm drainage and sewer system(s).	Dept. Public Infrastructure	Two (2) years	Funding for engineering study, permitting, and design, as well as, improvements.
Capital and Structural Improvements	Undertake drainage improvements to address flooding at St. Luke's Hospital.	Dept. Public Infrastructure	Two (2) years	Funding for engineering study, permitting, and design, as well as, improvements.
Adopt Regulations to address disaster mitigation.	Adopt stormwater management ordinance to address Low Impact Development (LID) and green infrastructure requirements.	Dept. of Planning, Housing and Community Development	One (1) year	N/A (Currently drafting Stormwater Ordinance/LID regulations; anticipated adoption in 2015)
Undertake Capital and Structural Improvements to achieve disaster mitigation.	Expand Pope's Island Marina to create more berths for recreational vessels to utilize during storm events.	Harbor Development Commission	Three (3) to seven (7) years	Funding for planning, design, permitting and construction.
Integrate disaster mitigation into ongoing planning efforts.	Integrate disaster mitigation into next Comprehensive Plan	Planning Department	Next planning cycle.	Funding for planning and engineering to update plan.

Objective	*Action*	*Responsible Parties*	*Timeline*	*Resources Needed*
Capital and Structural Improvements	Undertake drainage improvements to address street flooding within Route 18, Hillman Street, Pearl Street, and at the intersection of Acushnet Avenue and Pearl Street in the vicinity of the Railyard, Division of Career Services, and Whale's Tooth Parking Lot.	Dept. Public Infrastructure	Three (3) years	Funding for engineering study, permitting, and design, as well as, improvements.
Capital and Structural Improvements	Undertake improvements to the Buttonwood Park Pond and Dam to address overtopping during storm events.	Dept. Public Infrastructure	Five (5) years	Funding for engineering study, permitting, and design, as well as, improvements.
Integrate disaster mitigation into ongoing planning efforts.	Incorporate Disaster Mitigation Plan capital and O&M projects into City's updated Long Term CSO Control (LTCP) and Capital Improvements Plan (CIP) as appropriate.	Dept. Public Infrastructure	Two (2) years.	Funding to integrated into LTCP/CIP
Capital and Structural Improvements	Undertake drainage improvements at Brownell and Hawthorn Street to address localized flooding	Dept. Public Infrastructure	Three (3) years	Funding for engineering study, permitting, and design, as well as, improvements.
Capital and Structural Improvements	Establish "micro-grids" within key City locations for auxiliary power.	Dept. Public Infrastructure, Public Facilities	Three (3) years	Funding for engineering study, permitting, and design, as well as, improvements
Capital and Structural Improvements	Undertake improvements at the New Bedford Reservoir Dam and Turner's Pond Dam	Dept. Public Infrastructure	Five (5) years	Funding for engineering study, permitting, and design, as well as, improvements.
Low Priority Mitigation Actions				
Capital and Structural Improvements	Undertake drainage improvements to address flooding at the intersections of Route 18 and Wamsutta Street, Wamsutta Street and North Front Street, Wamsutta Street and Acushnet Avenue and at the Wamsutta Street Pump Station.	Dept. Public Infrastructure and MassDOT	Three (3) years	Funding for engineering study, permitting, and design, as well as, improvements.
Capital and Structural Improvements	Undertake drainage improvements to address localized flooding associated with an unnamed stream to the east of Acushnet Avenue, in the area of Sheffield Street, southerly to Stratford Street and in the downstream portion of the City's Combined Sewer Overflow 027 drain system reach in the northern part of the City.	Dept. Public Infrastructure	Five (5) years	Funding for analysis/planning, engineering, permitting, and construction.

Objective	*Action*	*Responsible Parties*	*Timeline*	*Resources Needed*
Capital and Structural Improvements	Undertake drainage improvements to address railway swale flooding from Tarkiln Hill Road to Nash Road Pond.	Dept. Public Infrastructure	Three (3) years	Funding for planning, design, permitting, and construction.
Adopt Regulations to address disaster mitigation.	Study the issue of downzoning the portions of the peninsula that are Residence B (two-family) to Residence A (single-family), to decrease the density of the area and thus minimize the residents and property put at risk in this area not protected by the hurricane barrier.	Dept. of Planning, Housing and Community Development	Three (3) to five (5) years.	Possible funding required for analysis of the area.
Capital and Structural Improvements	Construct West End CSO Separation Contract Phase IV	Dept. Public Infrastructure	Five (5) years	Funding for planning, design, permitting, and construction
Capital and Structural Improvements	Construct West End CSO Separation Contract Phase V	Dept. Public Infrastructure	Five (5) years	Funding for planning, design, permitting, and construction
Capital and Structural Improvements	Undertake improvements to the Assawompsett Dam.	Dept. Public Infrastructure	Four (4) years	Regional cooperation between adjacent communities. Funding for planning, design, permitting and construction.
Improve Operations, Administration, and Enforcement	Pursue the development of a clearer agreement between the City of Taunton and the City of New Bedford on the ownership, maintenance, and control of the Assawompsett Dam.	Dept. Public Infrastructure	Two (2) years.	Staff time and legal assistance.

Section 6
Plan Monitoring, Evaluating and Updating

Monitoring, evaluating, and updating the City's Hazard Mitigation Plan are important steps in creating an effective document. Periodic revision and updates ensure that the hazard mitigation objectives and activities for New Bedford are kept current.

The Emergency Management Director will schedule and conduct an annual plan review meeting with the Pre-Disaster Mitigation Planning Committee. The Committee will review the proposed mitigation actions or projects to determine their current status; difficulties being encountered; changes to responsible parties; completion timeline or needed resources; their relevance to changing conditions in the City; and the need to modify these actions. The review will include site visits to appropriate locations where projects are being or have been implemented. Additionally, the Committee will determine any new actions or projects to include in an update of the Plan.

A review and evaluation of the entire Hazard Mitigation Plan will be done on a five-year basis in accordance with the Disaster Mitigation Act of 2000, or after any significant natural disaster that impacts the City.

The public will be provided the opportunity to review the existing plan and submit comments and project suggestions as part of the annual review process. Comments will be solicited through either a public meeting and/or the availability of the plan at public locations such as libraries and on the City's website. A formal public meeting or meetings shall be part of the five-year review process.

Notifications of public meetings and comment solicitations, as well as locations where copies of the Plan are available for review, will be through multiple means including local newspapers, cable access TV bulletin board, the City's website, and the City Clerk's Public Notice Board at City Hall.

Appendix A
Public Participation

Agenda

New Bedford Hazard Mitigation Plan Update

Location: Department of Public Infrastructure, 1105 Shawmut Avenue, New Bedford
Meeting Time: 9:00 am-10:00 am

1. Introductions
2. Discussion of FEMA Requirements/Checklist
3. Discussion of Plan Elements
4. Discussion of NFIP Flood Maps Adoption
5. Action Items

CDM Smith

New Bedford Hazard Mitigation Plan Update
Sign-In Sheet

Location: Department of Public Infrastructure, 1105 Shawmut Avenue, New Bedford
Meeting Time: 9:00 am-10:00 am

Name	Organization	Email Address
Dianne Velardocchia	CDM Smith	velardocchiade@cdmsmith.com
ZEB ARRUDA	NBDPI	ZEB.ARRUDA@NEWBEDFORD-MA.GOV
MARK MAHONEY	NEW BEDFORD EMA	MARK MAHONEY @ NEWBEDFORD-MA.GOV
Ginny Roach	CDM Smith	roachva@cdmsmith.com
Ronald H. Labelle	DPI	RonaldL@newbedford-ma.gov
Shawn Syde	CDM Smith	sydest@cdmsmith.com

Agenda

New Bedford Hazard Mitigation Plan Update

Location: Fort Tabor Community Center, 1000 East Rodney French Boulevard, New Bedford
Meeting Time: October 14, 2014 9:00 am-12:00 Noon

1. Introductions
2. Discussion of FEMA Hazard Mitigation Plan Elements
3. Discussion of Mitigation Team
4. Discussion of Hazard Mitigation Mapping
5. Discussion of Past/Planned Mitigation Measures
6. Schedule

   November 7, 2014 – Deadline to complete past/planned mitigation measures

   November 21, 2014 – Complete draft Hazard Mitigation Plan Update and submit to team for review/post of City website for public comment

   November 21 – December 12, 2014 – Team reviews draft Hazard Mitigation Plan Update/Public Comment Period. Conduct a public meeting during this time period (date TBD).

   December 12, 2014 – Deadline for comments on draft Hazard Mitigation Plan Update

   December 19, 2014 – Submit Hazard Mitigation Plan Update to FEMA for review

   Early July 2015 – Hazard Mitigation Grant Applications due

7. Action Items

CDM Smith

New Bedford Hazard Mitigation Plan Update

Sign-In Sheet

Location: Fort Tabor Community Center, 1000 East Rodney French Boulevard, New Bedford
Meeting Time: October 14, 2014 9:00 am-12:00 Noon

Name	Organization	Email Address
1. Dianne Velardocchia	CDM Smith	velardocchiade@cdmsmith.com
2. Ronald H. Labelle	DPI	RonaldH@NewBedford-MA.Gov
3. DAVID FREDETTE	DPI	DAVID.FREDETTE@NEWBEDFORDMA.GOV
4. Jill Maclean	Planning	jill.maclean@newbedford-ma.gov
5. MICHELE PAUL	NB ENV. STEWARDSHIP	MICHELE.PAUL@NEWBEDFORD-MA.GOV
6. ZEB ARRUDA	NB DPI	ZEB.ARRUDA@NEWBEDFORD-MA.GOV
7. John Lobo	Community Services	John.lobo@newbedford.-MA.gov
8. CYNTHIA WALLQUIST	COMMUNITY SERVICES	CYNTHIA.WALLQUIST@Newbedford-ma.gov
9. MARK MAHONEY	N.B. EMERGENCY MGMT.	MARK.MAHONEY@NEWBEDFORD-MA.GOV
10. MARK McGraw	NB Emergency Medical Services	mark.mcgraw@newbedford-ma.gov
11. LT. Richard Rezendes	NB Police Dept.	Richard.Rezendes@NewBedfordPd.com
12. Kristi Sinkus	MA Property Insurance FAIR Plan	ksinkus@mpiua.com

CDM Smith

New Bedford Hazard Mitigation Plan Update

Sign-In Sheet

Name	Organization	Email Address
13. Sarah Porter	CNB - Conservation Agent Environmental Stewardship	Sarah.Porter@newbedford-ma.gov
14. Jeffrey Stieb	NB Harbor Development Commission	Jeffrey.Stieb@newbedford-ma.gov
15. Paul N Coderre Jr	New Bedford Fire Dept	Paul-CoderreJr@newbedford-ma.gov
16. Andrea Lague	NB Health Dept	andrea.lague@newbedford-ma.gov
17. Kara Hebert	NB Health Dept	HebertKARA4510@GMAIL.COM
18.		
19.		
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Appendix B

City Council Resolution

Appendix C

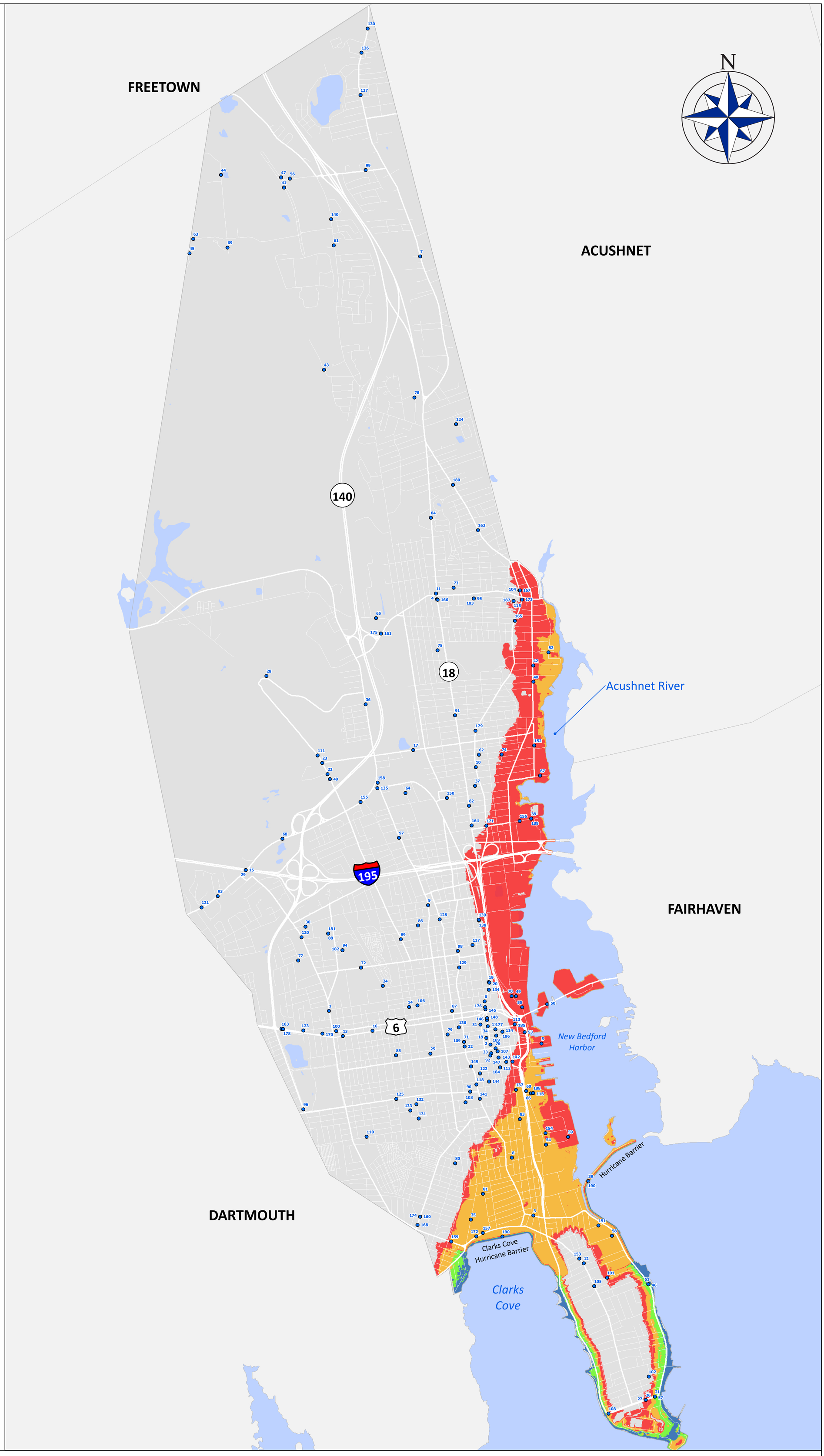
Natural Hazard Maps

New Bedford - Critical Infrastructure

This table references the locations of the City of New Bedford Critical Infrastructure locations. Use the **ID #** provided below to identify the corresponding facility on the map. The **Location Column** can be used to identify Critical Infrastructure locations on the Evacuation and Hurricane Surge Inundation Zone maps to obtain further details. These locations have been color coded in the **Type** column based upon the values below. An asterisk * denotes Evacuation Shelter Locations.

#	Public Facilities	#	Medical Facilities
#	Government Facilities	#	Housing Facilities
#	Tier 2 HAZMAT Facilities	#	Markets and Food Supply
#	Schools	#	Pharmacies
#	Non Government Facilities	#	Critical Facilities

Location	Type/ID	Description/Address
South	1	Police Headquarters @ 871 Rockdale Ave
South	2	Police Station 1 @ 572 Pleasant St
South	3	Police Station 2 @ 168 Cove St
North	4	Police Station 3 @ 781 Ashley Blvd
South	5	Massachusetts Environmental Police @ State Pier
South	6	Fire Headquarters/Station 2 @ 868 Pleasant St
North	7	Fire Station 5 @ 3665 Acushnet Ave
South	8	Fire Station 6 @ 151 Purchase St
South	9	Fire Station 7 @ 700 Cottage St
South	10	Fire Station 8 @ 1599 Acushnet Ave
North	11	Fire Station 9 @ 799 Ashley Blvd
South	12	Fire Station 11 @ 754 Brock Ave
South	13	Emergency Management Hdqrs HQ/Alternate Operations Center @ 834 Kempton St
South	14	Emergency Medical Services Office @ Hillman St
South	15	Hathaway Road Water Tower @ 609 Hathaway Rd
South	16	STAT Ambulance Service @ 689 Kempton St
South	17	Alert Ambulance Service @ 404 Nash Rd
South	18	New Bedford City Hall @ 133 William St
South	19	New Bedford Health Department @ 1213 Purchase St
South	20	New Bedford City Building @ 1204 Purchase St
South	21	New Bedford Wastewater Treatment Plant @ 1000 S Rodney French Blvd
South	22	New Bedford Department of Public Infrastructure @ 1105 Shawmut Ave
South	23	New Bedford Solid Waste Transfer Station @ 1103 Shawmut Ave
South	24	New Bedford Department of Public Facilities @ 294 Liberty St
South	25	Bristol County Jail @ 226 Ash St
South	26	New Bedford Cable Access @ 918 S Rodney French Blvd
South	27	U.S. Coast Guard Marine Safety Office @ 918 S Rodney French Blvd
North	28	New Bedford Regional Airport @ 1569 Airport Rd
South	29	New Bedford Water Department Hathaway Road Water Tower @ 609 Hathaway Rd
South	30	New Bedford Water Department Rowe Street Pump Station @ 33 Rowe St
South	31	Massachusetts Trial Court New Bedford District @ 75 N 6th St
South	32	Bristol County Superior Court @ 443 County St
South	33	Massachusetts Probate & Family Court New Bedford District @ 505 Pleasant St
South	34	United States Post Office - Main @ 695 Pleasant St
South	35	United States Post Office - South @ 584 Orchard St
North	36	United States Post Office - North @ 748 Mount Pleasant St
South	37	United States Post Office - West @ 282 Coffin Ave
South	38	Environmental Protection Agency & USACE Dewatering Facility @ 103 Sawyer St
South	39	USACE Hurricane Barrier System Harbor Segment @ New Bedford, Massachusetts
North	40	Acushnet Company - Ball Plant C @ 700 Belleville Ave
North	41	Acushnet Company - Ball Plant III @ 215 Duchaine Blvd
North	42	Acushnet Rubber Co. - Building B @ 744 Belleville Ave
North	43	Aegis (HCC Aegis) @ 50 Welby Rd
North	44	Aerovox Corporation @ 167 John Vertente Blvd
North	45	AFC Cable Systems @ Flaherty Dr
South	46	Allegheny Ludlum, LLC @ 1357 E Rodney French Blvd
North	47	American Cable Systems @ 260 Duchaine Blvd
South	48	Amerigas Propane - New Bedford @ 1079 Shawmut Ave
South	49	APS / American Seafoods @ 40 Herman Melville Blvd
South	50	Bridge Terminal @ 12 Fish Is
South	51	Brittany Dyeing and Printing Corp @ 1357 E Rodney French Blvd
North	52	Coyne Textile Services @ 20 Howard Ave
South	53	Crystal Ice Co., Inc. @ 178 Front St
South	54	Foley Fish (M.F. Foley, Inc.) @ 77 Wright St
South	55	Maritime Terminal, Inc. @ 276 MacArthur Dr
North	56	Morgan Advanced Ceramics @ 225 Theodore Rice Blvd
South	57	New Bedford WWTP @ 1000 S Rodney French Blvd
South	58	North East Silocon Technoligies @ 11 David St
South	59	Northern Wind, Inc. @ 16 Hassey St
South	60	NSTAR - New Bedford Service Center @ 180 MacArthur Dr
North	61	NSTAR - Phillips Road Station @ 1885 Phillips Rd
South	62	NSTAR - Hathaway Street Station @ 92 Hathaway St
North	63	Polyneer, Inc. @ Samuel Barnet Blvd
South	64	Purity Services @ 405 Myrtle St
North	65	ROTHTEC Engraving Corporation @ 699 Tarkiln Hill Rd
South	66	Sprague New Bedford Terminal @ 30 Pine St
South	67	Star Plating (Plating Technology, Inc) @ 41 Coffin Ave
South	68	Sullivan't Ledge Groundwater TP @ 458 Hathaway Rd
North	69	Symmetry Medical New Bedford @ 61 John Vertente Blvd
South	70	West Terminal @ 289 MacArthur Dr
South	71	New Bedford Public Schools Administration Building @ 455 County St
South	72	New Bedford Public Schools Maintenance Operations @ 256 Parker St
North	73	All Saints Catholic School @ 115 Illinois St
South	74	Alma del Mar Charter School @ 26 Madeiros Ave
North	75	Ashley School @ 122 Rochambeau St
South	76	Bristol Community College - New Bedford Campus @ 188 Union St
South	77	Brooks School @ 212 Nemasket St
North	78	Campbell School @ 145 Essex St
South	79	Carney Academy @ 247 Elm St
South	80	Congdon School @ 50 Hemlock St
South	81	DeValles School @ 120 Katherine St
South	82	Global Learning Charter School @ 190 Ashley Blvd
South	83	Gomes School @ 286 S 2nd St
North	84	Greater New Bedford Regional Vocational Technical High School @ 1121 Ashley Blvd
South	85	Hathaway School @ 256 Court St
South	86	Hayden-McFadden School @ 361 Cedar St
South	87	Holy Family-Holy Name School @ 91 Summer St
South	88	Keith Middle School @ 225 Hathaway Blvd
South	89	Kempton School @ 135 Shawmut Ave
South	90	Kennedy -Donavan Center School @ 19 Hawthorn St
North	91	Lincoln School @ 445 Ashley Blvd
South	92	Nativity Preparatory School @ 66 Spring St
South	93	Nazarene Christian Academy @ 764 Hathaway Rd
South	94	New Bedford High School @ 230 Hathaway Blvd
North	95	Normandin Middle School @ 81 Felton St
South	96	Our Sister's School @ 145 Brownell Ave
South	97	Pacheco Elementary School @ 261 Mt Pleasant St
South	98	Parker School @ 705 County St
North	99	Pulaski School @ 1079 Braley Rd
South	100	Rodman School @ 497 Mill St
South	101	Roosevelt Middle School @ 119 Frederick St
South	102	Sea Lab / Hannigan School @ 71 Portland St
South	103	Saint James /Saint John School @ 180 Orchard St
North	104	Swift School @ 2203 Acushnet Ave
South	105	Taylor School @ 620 Brock Ave
South	106	Trinity Day Academy @ 181 Hillman St
South	107	UMASS Dartmouth College of Visual & Performing Arts @ 715 Purchase St
South	108	UMASS Dartmouth School for Marine Science & Technology @ 706 S Rodney French Blvd
South	109	Whaling City Alternative High School @ 455 County St
South	110	Winslow School @ 561 Allen St
South	111	Algonquin Gas Transmission - Metering Station @ 1201 Shawmut Ave
South	112	Salvation Army @ 619 Purchase St
South	113	Standard Times @ 25 Elm St
South	114	Verizon New Bedford Central Office @ 390 Acushnet Ave
North	115	Verizon Acushnet Central Office @ 56 Plympton St
South	116	Sprague Energy @ 1 Pine St
South	117	Bedford Village Nursing Home @ 9 Pope St
South	118	Brandon Woods of New Bedford @ 397 County St
South	119	Greater New Bedford Community Health Center @ 874 Purchase St
South	120	Kindred Nursing and Rehabilitation Center @ 1123 Rockdale Ave
South	121	Hathaway Manor Extended Care Facility @ 863 Hathaway Rd
South	122	Havenwood Rest Home @ 251 Walnut St
South	123	New Bedford Child & Family Services @ 543 North St
North	124	New Bedford Health Care Center @ 221 Fitzgerald Dr
South	125	New Bedford Jewish Convalescent Home @ 200 Hawthorn St
North	126	New Bedford Rehabilitation Hospital @ 4499 Acushnet Ave
North	127	The Oaks Long Term Care Facility @ 4325 Acushnet Ave
South	128	Sacred Heart Nursing Home @ 359 Summer St
South	129	Savoy Nursing and Rehabilitation Center @ 670 County St
North	130	Southeast Mass Health and Rehabilitation Center @ 4586 Acushnet Ave
South	131	Saint Luke's Hospital @ 101 Page St
South	132	Saint Luke's / Southcoast Hospital Group @ 157 Page St
South	133	Taber Street Nursing and Rehabilitation Center @ 19 Taber St
South	134	Metromedic Walk-In Medical Center @ 1155 Purchase St
South	135	Tristan Medical Care New Bedford Walk-In @ 140 Nauset St
South	136	Bedford Towers @ 231 Middle St
South	137	Boa Vista Towers @ 134 S 2nd St
South	138	Car Barn Apartments @ 1659 Purchase St
South	139	Carriage House Apartments @ 1661 Purchase St
North	140	Casey-Miller Apartments @ 2062 Phillips Rd
South	141	Grinnel Congregate Home for Elderly @ 379 County St
South	142	Harborview Towers East @ 60 S 2nd St
South	143	Harborview Towers West @ 280 Acushnet Ave
South	144	Mechanic Square Apartments @ 39 S 6th St
South	145	Melville Towers @ 850 Pleasant St
South	146	New Bedford Hotel Apartments @ 725 Pleasant St
South	147	Olympia Towers Apartments @ 651 Purchase St
South	148	Regency Tower Apartments @ 800 Pleasant St
South	149	Roosevelt Apartments @ 415 County St
South	150	Taber Mill Apartments @ 217 Deane St
South	151	Tripp Towers Apartments @ 12 Ruth St
South	152	Whaler's cove Assisted Living Facility @ 114 Riverside Ave
South	153	Young House Elderly Housing @ 790 Brock Ave
South	154	PriceRite @ 39 South St
South	155	PriceRite @ 139 Hathaway Rd
South	156	Market Basket @ 122 Sawyer St
South	157	Save-A-Lot Food Stores @ 1339 Cove Rd
South	158	Save-A-Lot Food Stores @ 452 Mount Pleasant St
South	159	A & J Seabra Supermarket @ 41 Rockdale Ave
South	160	Stop & Shop @ 438 Dartmouth St
North	161	Stop & Shop @ 1001 Kings Hwy
North	162	Trucci's Market @ 2491 Acushnet Ave
South	163	CVS Pharmacy @ 1145 Kempton St
South	164	CVS Pharmacy @ 136 Ashley Blvd
North	165	CVS Pharmacy @ 2100 Acushnet Ave
North	166	CVS Pharmacy @ 786 Ashley Blvd
North	167	PharmaHealth Pharmacy @ 2206 Acushnet Ave
South	168	PharmaHealth Pharmacy @ 458 Dartmouth St
South	169	Rite Aid Pharmacy @ 824 Purchase St
South	170	Rite Aid Pharmacy @ 565 Mill St
South	171	Rite Aid Pharmacy @ 1207 Acushnet Ave
South	172	Rite Aid Pharmacy @ 1383 Cove Rd
North	173	Rite Aid Pharmacy @ 2170 Acushnet Ave
South	174	Stop & Shop Pharmacy @ 438 Dartmouth St
North	175	Stop & Shop Pharmacy @ 1001 Kings Hwy
South	176	Walgreens Pharmacy @ 838 Pleasant St
South	177	Walgreens Pharmacy @ 874 Purchase St
South	178	Walgreens Pharmacy @ 1103 Kempton St
North	179	Walgreens Pharmacy @ 1737 Acushnet Ave
North	180	Walgreens Pharmacy @ 2698 Acushnet Ave
South	181*	Keith Middle School @ 225 Hathaway Blvd
South	182*	New Bedford High School @ 230 Hathaway Blvd
North	183*	Normandin Middle School @ 81 Felton St
South	184	Salvation Army @ 619 Purchase St
South	185	Standard Times @ 25 Elm St
South	186	Verizon New Bedford Central Office @ 390 Acushnet Ave
North	187	Verizon Acushnet Central Office @ 56 Plympton St
South	188	Sprague Energy @ 1 Pine St
South	189	Environmental Protection Agency & USACE Dewatering Facility @ 103 Sawyer St
South	190	USACE Hurricane Barrier System Harbor Segment @ New Bedford, Massachusetts



Legend

Hurricane Surge Inundation Zones

- Category 1
- Category 2
- Category 3
- Category 4
- Critical Infrastructure Site

"**Source:**
http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/hurr-inun.html"

New Bedford, MA

Natural Hazard Maps

Date: 12/23/2014

0 1,800 3,600 5,400 7,200 Feet

Map C-1
Hurricane Surge Inundation Zones

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New Bedford - Critical Infrastructure

This table references the locations of the City of New Bedford Critical Infrastructure locations. Use the **ID #** provided below to identify the corresponding facility on the map. The **Location Column** can be used to identify Critical Infrastructure locations on the Evacuation and Hurricane Surge Inundation Zone maps to obtain further details. These locations have been color coded in the **Type** column based upon the values below. An asterisk * denotes Evacuation Shelter Locations.

#	Public Facilities	#	Medical Facilities
#	Government Facilities	#	Housing Facilities
#	Tier 2 HAZMAT Facilities	#	Markets and Food Supply
#	Schools	#	Pharmacies
#	Non Government Facilities	#	Critical Facilities

Location	Type/ID	Description/Address
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South	2	Police Station 1 @ 572 Pleasant St
South	3	Police Station 2 @ 168 Cove St
North	4	Police Station 3 @ 781 Ashley Blvd
South	5	Massachusetts Environmental Police @ State Pier
South	6	Fire Headquarters/Station 2 @ 868 Pleasant St
North	7	Fire Station 5 @ 3665 Acushnet Ave
South	8	Fire Station 6 @ 151 Purchase St
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South	27	U.S. Coast Guard Marine Safety Office @ 918 S Rodney French Blvd
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South	30	New Bedford Water Department Rowe Street Pump Station @ 33 Rowe St
South	31	Massachusetts Trial Court New Bedford District @ 75 N 6th St
South	32	Bristol County Superior Court @ 443 County St
South	33	Massachusetts Probate & Family Court New Bedford District @ 505 Pleasant St
South	34	United States Post Office - Main @ 695 Pleasant St
South	35	United States Post Office - South @ 584 Orchard St
North	36	United States Post Office - North @ 748 Mount Pleasant St
South	37	United States Post Office - West @ 282 Coffin Ave
South	38	Environmental Protection Agency & USACE Dewatering Facility @ 103 Sawyer St
South	39	USACE Hurricane Barrier System Harbor Segment @ New Bedford, Massachusetts
North	40	Acushnet Company - Ball Plant C @ 700 Belleville Ave
North	41	Acushnet Company - Ball Plant III @ 215 Duchaine Blvd
North	42	Acushnet Rubber Co. - Building B @ 744 Belleville Ave
North	43	Aegis (HCC Aegis) @ 50 Welby Rd
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South	48	Amerigas Propane - New Bedford @ 1079 Shawmut Ave
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South	50	Bridge Terminal @ 12 Fish Is
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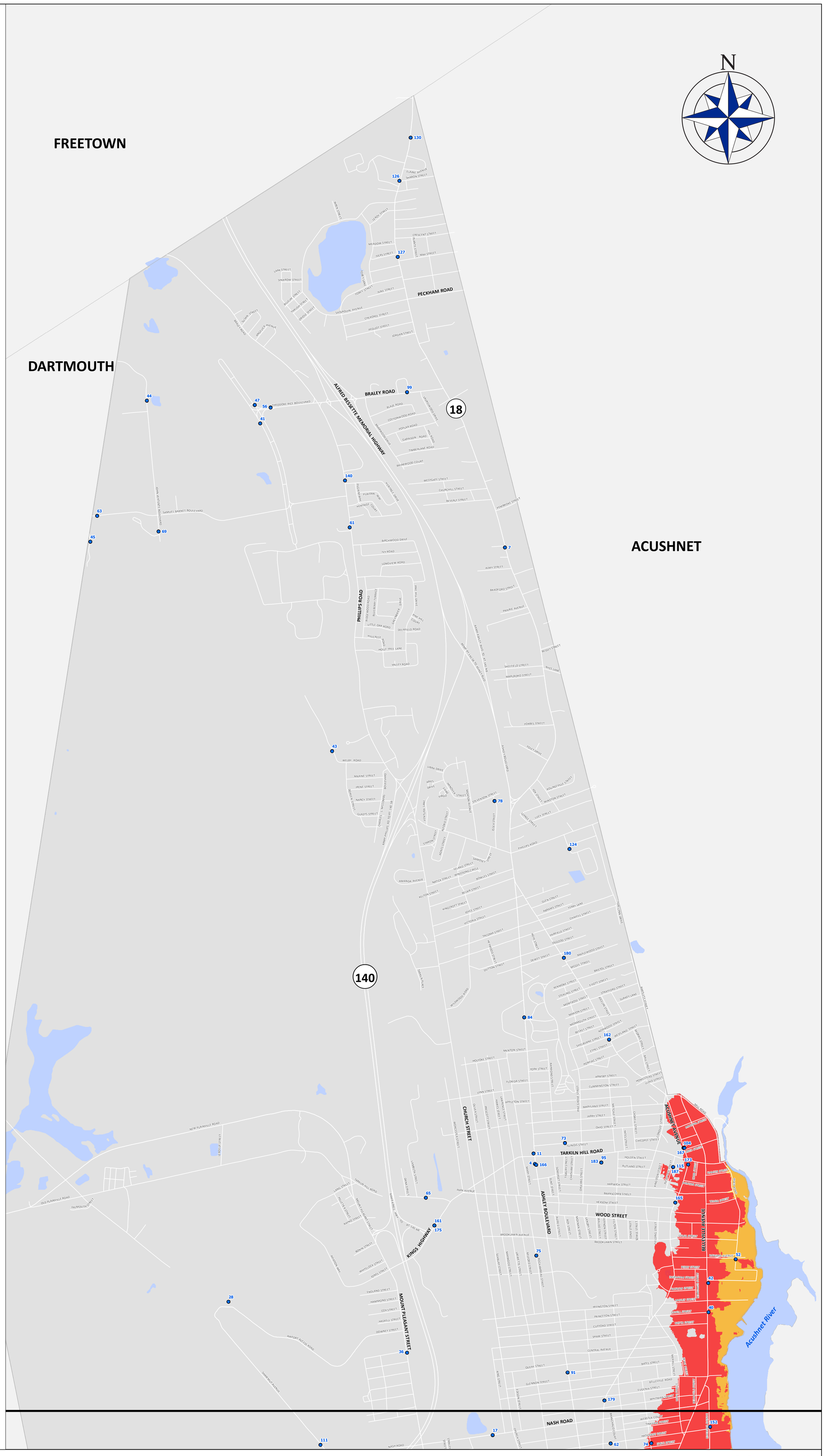

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New Bedford, MA

Natural Hazard Maps

Date: 12/23/2014

0 0.25 0.5 1 Miles

Map C-2
Hurricane Surge Inundation Zones North

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Matchline to North Map

ACUSHNET

FAIRHAVEN

Acushnet River

New Bedford Harbor

Clarks Cove Hurricane Barrier

Clarks Cove

Hurricane Barrier

N

New Bedford - Critical Infrastructure

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New Bedford, MA

Natural Hazard Maps

Date: 12/23/2014

0 0.25 0.5 1 Miles

Map C-3
Hurricane Surge Inundation Zones South

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New Bedford - Critical Infrastructure

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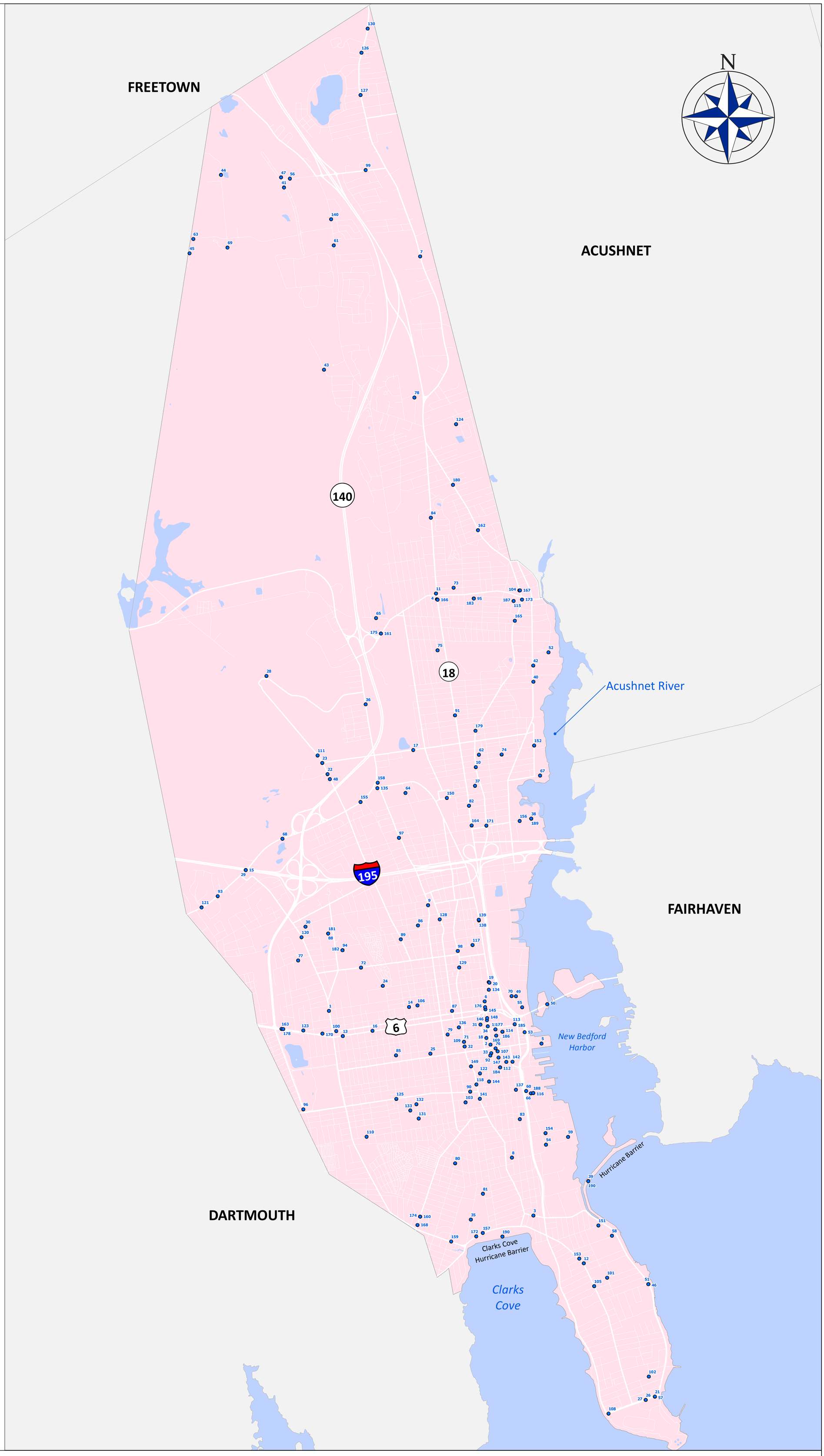

Legend

Average Annual Snowfall

- 12.1 to 24.0 inches
- 24.1 to 36.0 inches
- 36.1 to 48.0 inches
- 48.1 to 72.0 inches
- > 72.0 inches
- Critical Infrastructure Site

Source: Snowfall from SPREDD

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New Bedford, MA

Natural Hazard Maps

Date: 12/29/2014

0 1,800 3,600 5,400 7,200 Feet

Map C-4

Average Annual Snowfall

New Bedford - Critical Infrastructure

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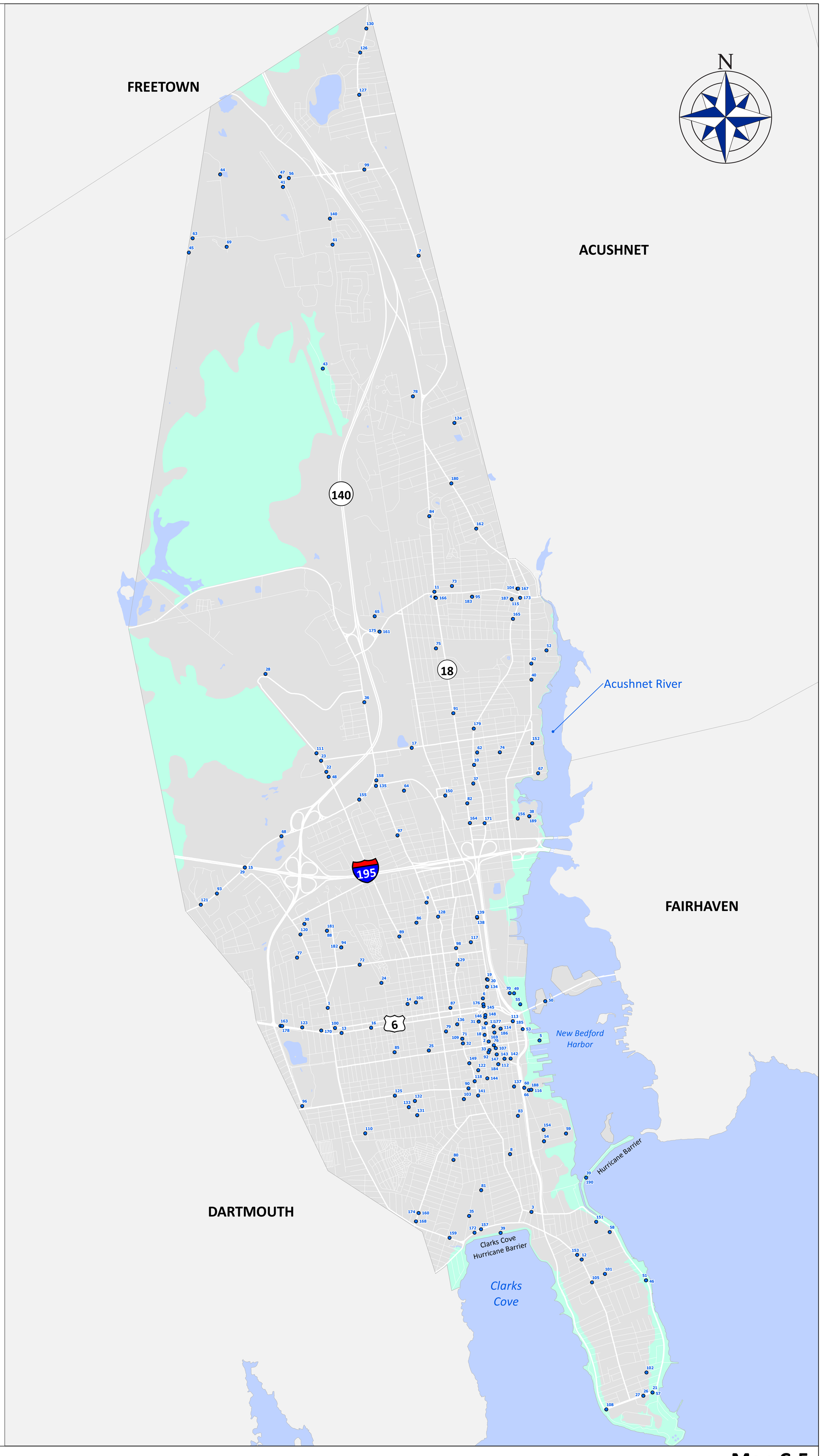

Legend

- 100-Year Flood Zone
- Critical Infrastructure Site

New Bedford, MA

Natural Hazard Maps

Date: 12/19/2014

0 1,800 3,600 5,400 7,200 Feet

Map C-5
100-Year FEMA Flood Zone

Source: FEMA Flood Map Data 2014 Effective Study

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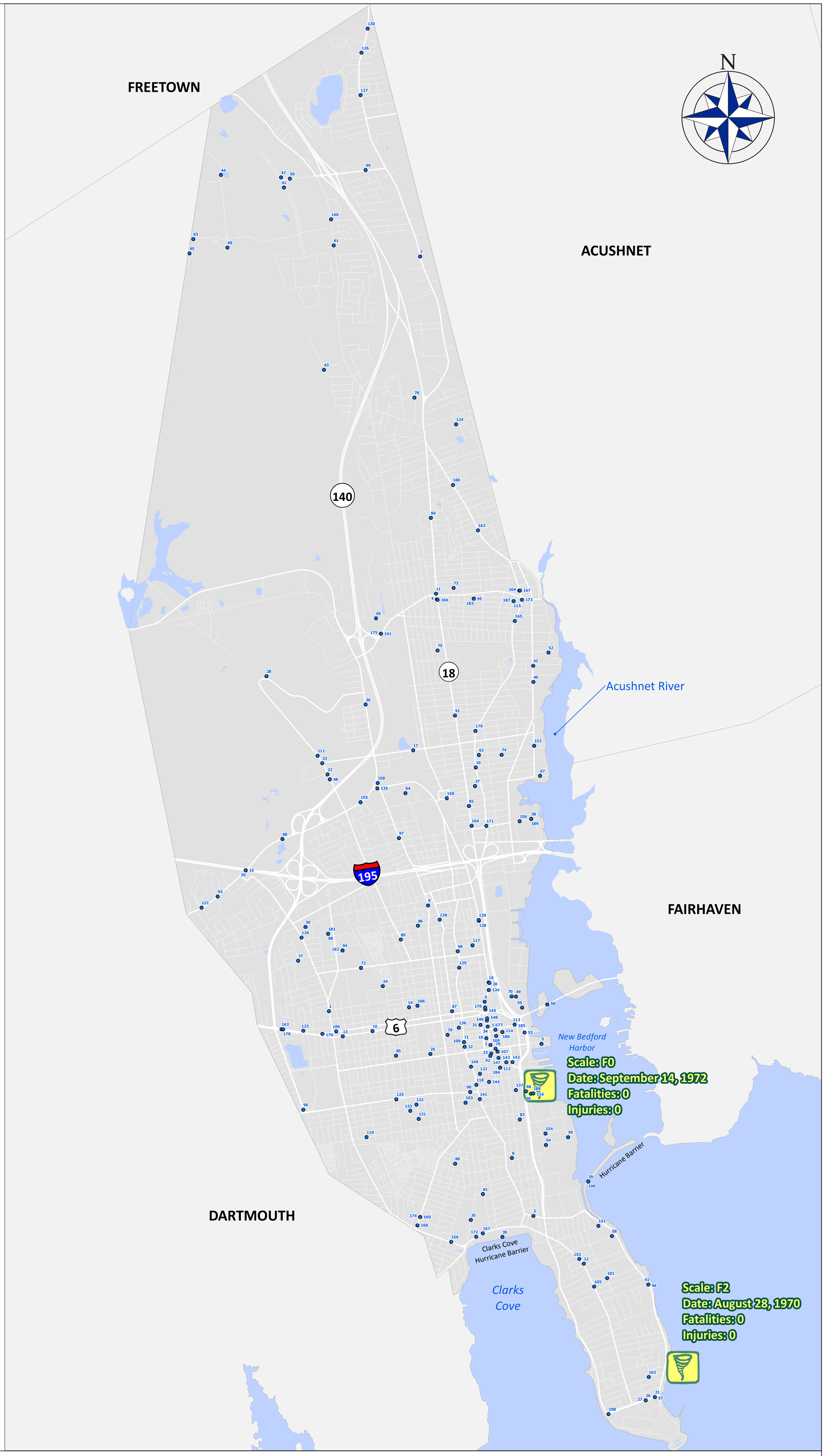

Legend

Tornadoes

- Critical Infrastructure Site

Source: http://www.tornadohistoryproject.com/tornado/Massachusetts

New Bedford, MA

Natural Hazard Maps

Date: 12/19/2014

0 1,750 3,500 5,250 7,000 Feet

Map C-6
Tornado Incidence

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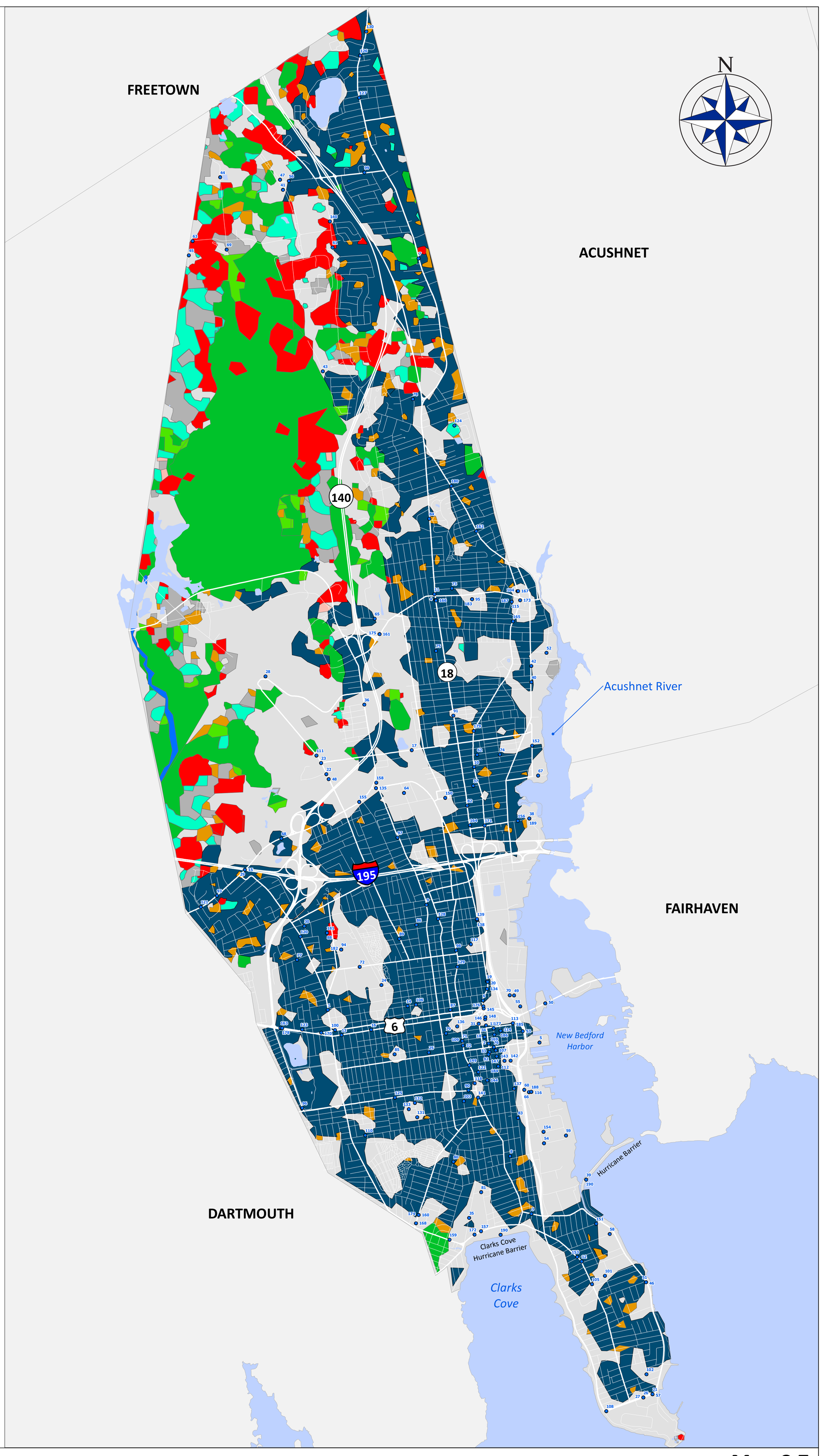

Legend

Forest Vegetation Types

- Forested Wetlands
- Mixed Hardwood/Pine
- Northern Hardwood
- Oak/Maple/Birch
- Water Bodies/Other Non-Vegetated Areas
- Critical Infrastructure Site
- Open Meadow
- Pitch Pine/Scrub Oak
- Red Maple Dominant
- Suburban Forest

Source: Wildfire from SPREDD

New Bedford, MA

Natural Hazard Maps

Date: 12/19/2014

0 1,800 3,600 5,400 7,200 Feet

Map C-7
Wildfire

Z:\99999_New_Bedford\HAZARD_MIDIGATION\DATA\MXD\Wildfire.mxd

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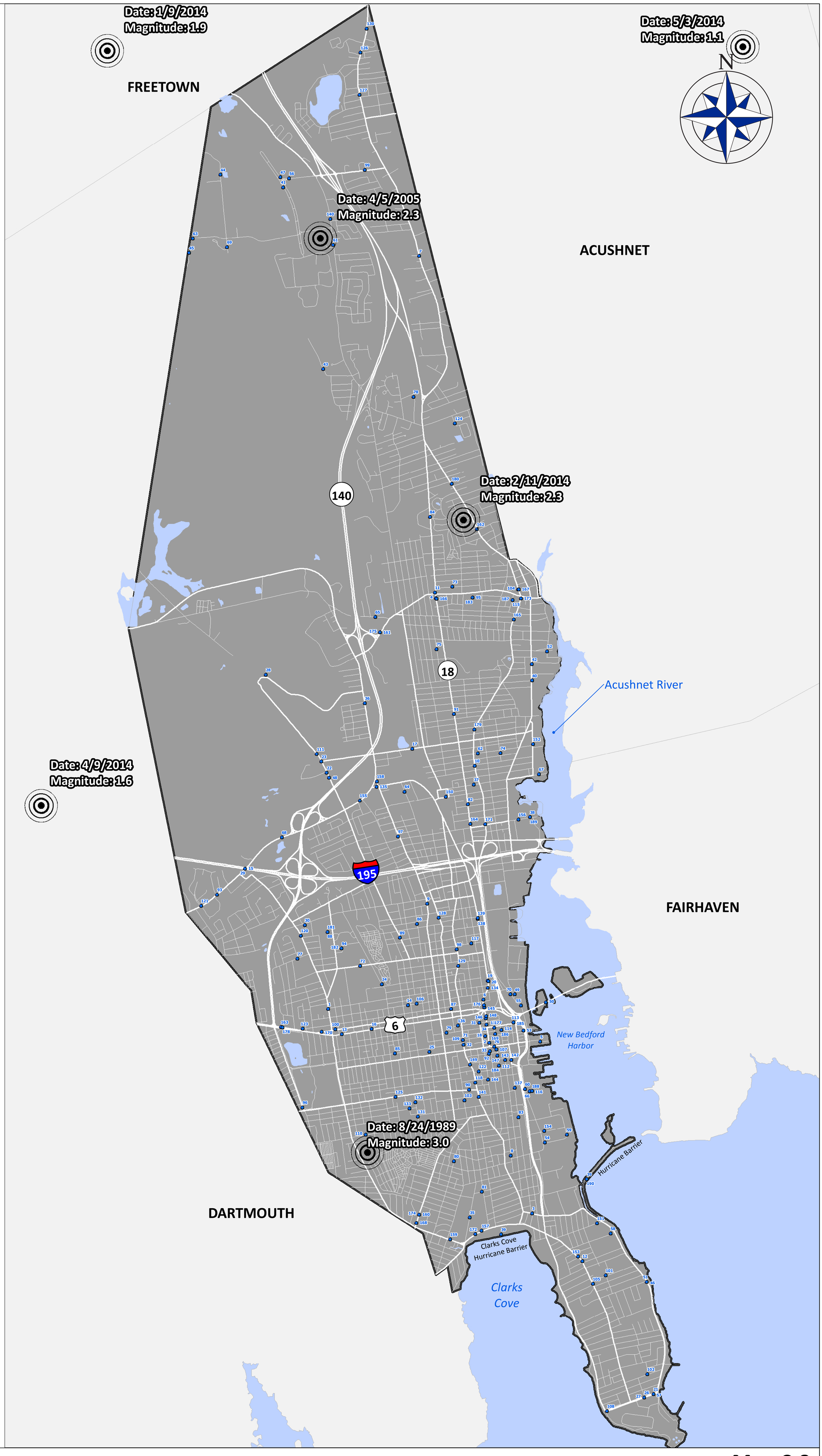
South	107	UMASS Dartmouth College of Visual & Performing Arts @ 715 Purchase St
South	108	UMASS Dartmouth School for Marine Science & Technology @ 706 S Rodney French Blvd
South	109	Whaling City Alternative High School @ 455 County St
South	110	Winslow School @ 561 Allen St
South	111	Algonquin Gas Transmission - Metering Station @ 1201 Shawmut Ave
South	112	Salvation Army @ 619 Purchase St
South	113	Standard Times @ 25 Elm St
South	114	Verizon New Bedford Central Office @ 390 Acushnet Ave
North	115	Verizon Acushnet Central Office @ 56 Plympton St
South	116	Sprague Energy @ 1 Pine St
South	117	Bedford Village Nursing Home @ 9 Pope St
South	118	Brandon Woods of New Bedford @ 397 County St
South	119	Greater New Bedford Community Health Center @ 874 Purchase St
South	120	Kindred Nursing and Rehabilitation Center @ 1123 Rockdale Ave
South	121	Hathaway Manor Extended Care Facility @ 863 Hathaway Rd
South	122	Havenwood Rest Home @ 251 Walnut St
South	123	New Bedford Child & Family Services @ 543 North St
North	124	New Bedford Health Care Center @ 221 Fitzgerald Dr
South	125	New Bedford Jewish Convalescent Home @ 200 Hawthorn St
North	126	New Bedford Rehabilitation Hospital @ 4499 Acushnet Ave
North	127	The Oaks Long Term Care Facility @ 4325 Acushnet Ave
South	128	Sacred Heart Nursing Home @ 359 Summer St
South	129	Savoy Nursing and Rehabilitation Center @ 670 County St
North	130	Southeast Mass Health and Rehabilitation Center @ 4586 Acushnet Ave
South	131	Saint Luke's Hospital @ 101 Page St
South	132	Saint Luke's / Southcoast Hospital Group @ 157 Page St
South	133	Taber Street Nursing and Rehabilitation Center @ 19 Taber St
South	134	Metromedic Walk-In Medical Center @ 1155 Purchase St
South	135	Tristan Medical Care New Bedford Walk-In @ 140 Nauset St
South	136	Bedford Towers @ 231 Middle St
South	137	Boa Vista Towers @ 134 S 2nd St
South	138	Car Barn Apartments @ 1659 Purchase St
South	139	Carriage House Apartments @ 1661 Purchase St
North	140	Casey-Miller Apartments @ 2062 Phillips Rd
South	141	Grinnel Congregate Home for Elderly @ 379 County St
South	142	Harborview Towers East @ 60 S 2nd St
South	143	Harborview Towers West @ 280 Acushnet Ave
South	144	Mechanic Square Apartments @ 39 S 6th St
South	145	Melville Towers @ 850 Pleasant St
South	146	New Bedford Hotel Apartments @ 725 Pleasant St
South	147	Olympia Towers Apartments @ 651 Purchase St
South	148	Regency Tower Apartments @ 800 Pleasant St
South	149	Roosevelt Apartments @ 415 County St
South	150	Taber Mill Apartments @ 217 Deane St
South	151	Tripp Towers Apartments @ 12 Ruth St
South	152	Whaler's cove Assisted Living Facility @ 114 Riverside Ave
South	153	Young House Elderly Housing @ 790 Brock Ave
South	154	PriceRite @ 39 South St
South	155	PriceRite @ 139 Hathaway Rd
South	156	Market Basket @ 122 Sawyer St
South	157	Save-A-Lot Food Stores @ 1339 Cove Rd
South	158	Save-A-Lot Food Stores @ 452 Mount Pleasant St
South	159	A & J Seabra Supermarket @ 41 Rockdale Ave
South	160	Stop & Shop @ 438 Dartmouth St
North	161	Stop & Shop @ 1001 Kings Hwy
North	162	Trucci's Market @ 2491 Acushnet Ave
South	163	CVS Pharmacy @ 1145 Kempton St
South	164	CVS Pharmacy @ 136 Ashley Blvd
North	165	CVS Pharmacy @ 2100 Acushnet Ave
North	166	CVS Pharmacy @ 786 Ashley Blvd
North	167	PharmaHealth Pharmacy @ 2206 Acushnet Ave
South	168	PharmaHealth Pharmacy @ 458 Dartmouth St
South	169	Rite Aid Pharmacy @ 824 Purchase St
South	170	Rite Aid Pharmacy @ 565 Mill St
South	171	Rite Aid Pharmacy @ 1207 Acushnet Ave
South	172	Rite Aid Pharmacy @ 1383 Cove Rd
North	173	Rite Aid Pharmacy @ 2170 Acushnet Ave
South	174	Stop & Shop Pharmacy @ 438 Dartmouth St
North	175	Stop & Shop Pharmacy @ 1001 Kings Hwy
South	176	Walgreens Pharmacy @ 838 Pleasant St
South	177	Walgreens Pharmacy @ 874 Purchase St
South	178	Walgreens Pharmacy @ 1103 Kempton St
North	179	Walgreens Pharmacy @ 1737 Acushnet Ave
North	180	Walgreens Pharmacy @ 2698 Acushnet Ave
South	181*	Keith Middle School @ 225 Hathaway Blvd
South	182*	New Bedford High School @ 230 Hathaway Blvd
North	183*	Normandin Middle School @ 81 Felton St
South	184	Salvation Army @ 619 Purchase St
South	185	Standard Times @ 25 Elm St
South	186	Verizon New Bedford Central Office @ 390 Acushnet Ave
North	187	Verizon Acushnet Central Office @ 56 Plympton St
South	188	Sprague Energy @ 1 Pine St
South	189	Environmental Protection Agency & USACE Dewatering Facility @ 103 Sawyer St
South	190	USACE Hurricane Barrier System Harbor Segment @ New Bedford, Massachusetts



Legend

Peak Ground Acceleration Zones

- 1-3% Light shaking, no damage
- 4-5% Moderate shaking, no damage
- 6-7% Moderate shaking, light damage
- 7-8% Strong shaking, light damage

Earthquakes

Critical Infrastructure Site

New Bedford, MA

Natural Hazard Maps

Date: 12/19/2014

0 1,800 3,600 5,400 7,200 Feet

Map C-8

Earthquake Incidence

Source: http://aki.bc.edu/cgi-bin/NESN/recent_events.pl

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Appendix D

Evacuation Maps

FREETOWN

DARTMOUTH

ACUSHNET

FAIRHAVEN

Matchline to South Map

Legend

Critical Facilities

- Public Saftey Facilities
- Government Facilities
- Tier 2 HAZMAT Facilities
- Schools
- Non Government Facilities
- Medical Facilities
- Housing Facilities
- Markets and Food Supply
- Pharmacies
- Critical Facilities
- Evacuation Shelter Locations
- Evacuation Routes

New Bedford, MA

Natural Hazard Maps

Date: 12/22/2014

Map D-1
Evacuation Map North

N

0 0.25 0.5 1 Miles

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Matchline to North Map

ACUSHNET

FAIRHAVEN

DARTMOUTH

Acushnet River

New Bedford Harbor

Clarks Cove

Clarks Cove Hurricane Barrier

Hurricane Barrier

Legend

Critical Facilities

- Public Saftey Facilities
- Government Facilities
- Tier 2 HAZMAT Facilities
- Schools
- Non Government Facilities
- Medical Facilities
- Housing Facilities
- Markets and Food Supply
- Pharmacies
- Critical Facilities
- Evacuation Shelter Locations
- Evacuation Routes

New Bedford, MA

Natural Hazard Maps

Date: 12/19/2014

Map D-2
Evacuation Map South

N

0 0.25 0.5 1 Miles

Z:\99999_New_Bedford\HAZARD_MIDIGATION\DATA\MXD\EvacuationRouteSouth_2.mxd

Appendix E

STAPLEE Forms

STAPLEE Criteria Worksheet

For all criteria indicate:

+ for favorable

- for less favorable

"N" for not applicable

Emergency Management

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL		COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	
Purchase and install auxiliary generators	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	N	+	+	N	N	N	N	17	1	
Improve warning capabilities - Reverse telephone nitification system	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	N	+	N	N	N	N	N	16	1	
Special Needs Registry	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	N	N	N	N	N	17	0	
Community preparedness outreach and messaging efforts	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	N	N	N	N	N	17	0	
Community Rating System (CRS) participation	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	18	1	
Debris Management Plan	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N	N	+	N	20	0	

STAPLEE Criteria Worksheet

For all criteria indicate:

+ for favorable
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"N" for not applicable

Emergency Management

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL		COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	
Provide auxiliary power to Regency Towers communications site	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	-	+	N	N	N	* -	17	3	* If federal grant funds are secured for part of project cost, EHP review may be required.

STAPLEE Criteria Worksheet

For all criteria indicate:

+ for favorable
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"N" for not applicable

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL		COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	
New Roof for Police Station #1	+	N	+	+	N	+	+	+	+	N	+	+	+	N	+	+	+	N	N	N	N	N	+	14	0	Replace aging roof
New Parking Lot / Drainage at Police Headqauters	+	N	+	+	N	+	+	+	+	N	+	+	+	N	+	+	+	N	N	N	N	N	+	14	0	Address flooding/ Safety issues
New Radio Antenna's/Repeaters/Satellite recievers/Battery Backup Sytems for Emergency Radio Broadcast Towers for Police / Fire / EMS/	+	N	+	+	N	+	+	+	+	N	+	+	+	N	+	+	+	N	N	N	N	N	+	14	0	Replace aging radio / antena /tower system

STAPLEE Criteria Worksheet

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STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL		COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	
Radio transmiter Genorator	+	+	+	+	+	N	_	+	+	+	+	N	+	N	+	+	+	+	N	N	N	N	+	15	1	Major comunication issue
Fire Alarm Upgrade	+	+	+	+	+	N	_	+	+	+	+	N	+	N	+	+	+	+	N	N	N	N	+	15	1	Fire Department priority
Fire Station Upgrade	+	+	+	+	+	N	_	+	+	+	+	N	+	N	+	+	+	+	N	N	N	N	+	15	1	Fire Department priority
EMT training	+	+	+	+	+	N	_	+	+	+	+	N	+	N	+	+	+	+	N	N	N	N	+	15	1	force multiplyer
Continuation of service plan	+	+	+	+	+	N	_	+	+	+	+	N	+	N	+	+	+	+	N	N	N	N	+	15	1	No plan in place
	+	+	+	+	+	N	_	+	+	+	+	N	+	N	+	+	+	+	N	N	N	N	+	15	1	

STAPLEE Criteria Worksheet

For all criteria indicate:

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- for less favorable
"N" for not applicable

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL		COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	
Study rezoning of south end for downsizing of residential dwellings	–	–	+	–	–	+	–	N	–	–	–	N	+	–	N	–	N	–	N	N	N	N	N	3	11	As this area of the city is built-out, this zoning change may result in many non-conforming properties.
Adopt Stormwater Ordinance/LID regulations	+	–	+	+	–	+	+	–	+	N	+	N	+	N	+	N	+	N	+	+	N	+	+	14	3	Currently underway and should be adopted in early 2015.
Integrate disaster planning into next comprehensive master plan	+	+	+	+	N	–	–	N	+	N	+	N	+	N	+	–	+	–	+	+	+	+	+	14	4	

STAPLEE Criteria Worksheet

For all criteria indicate:

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Undertake Captial and Structural Improvements to Achieve Disaster Mitigation

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL			COMMENTS
Considerations →	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	TIMELINE	
Alternative Actions ↓																										YEARS MONTHS & WEEKS	
Priority 1: Install a wave attenuator on the southwestern side of Pope's Island Marina	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	-	+	N	+	+	+	19	3	2 YEARS	
Priority 2: Repair, bolster and expand commercial fishing piers to be able to withstand larger fishing vessels during storm events.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	+	+	N	+	+	+	20	2	3 YEARS	
Priority 3: Replace all mooring anchors to helix-style and gear to hazelett style to make them more storm-resistant.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	-	+	+	+	+	+	20	3	2 YEARS	
Priority 4: Dredge all required areas within the Hurricane Barrier for commercial and recreational vessels permanently including during storm events.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	-	+	+	+	+	+	20	3	2 YEARS	
Priority 5: Fund Unified Command Center for Local, State and Federal emergency response agencies.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	-	+	+	N	N	+	18	3	4 YEARS	
Priority 6: Install storm mooring system in the CAD cell field north of Pope's Island	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	-	+	+	+	+	+	20	3	5 YEARS	

STAPLEE Criteria Worksheet

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- for less favorable
"N" for not applicable

Undertake Captial and Structural Improvements to Achieve Disaster Mitigation

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL			COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Required	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	TIMELINE YEARS MONTHS & WEEKS	
PRIORITY 7: Expand Pope's Island Marina to create more berths for recreational vessels to utilize during storm events.	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	-	-	N	N	-	+	16	5	5 YEARS	
PRIORITY 8: Assess and mitigate utility and infrastructure weaknesses on the waterfront.	+	+	+	+	+	+	-	+	+	+	+	N	+	+	+	-	+	-	+	N	N	+	+	17	3	3 YEARS	

STAPLEE Criteria Worksheet

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Undertake Captial and Structural Improvements to Achieve Disaster Mitigation

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL		COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	
PRIORITY 1 Install New SCADA System at Sewer Pump Stations Item 14	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	N	+	+	+	21	1	
PRIORITY 2 Clark Cove P.S. & Hurricane Barrier Ponding Area Improvements Item 2	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	N	N	+	+	20	1	
PRIORITY 3 Floodproof Sewer Pump Stations within Flood Prone Areas Item 15	+	+	+	+	+	+	-	+	-	+	+	+	+	+	+	-	+	-	+	N	+	+	+	18	4	
PRIORITY 4 Purchase & Install Back-Up Generation at DPI Complex @ 1105 Shawmut Avenue Item 11	N	N	+	+	+	+	-	+	-	+	+	+	+	+	+	-	+	+	N	N	N	+	+	17	3	
PRIORITY 5 Coggeshall Street Area Infrastructure Improvements Item 3	-	+	+	+	+	+	-	+	+	-	+	+	+	+	+	+	+	-	+	N	N	+	+	17	4	
PRIORITY 6 Maple & Chancery Streets Flooding Alleviation Item 6	+	+	+	+	+	+	-	+	+	-	+	+	-	+	+	-	+	-	+	N	N	+	+	16	5	

STAPLEE Criteria Worksheet

For all criteria indicate:

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"N" for not applicable

Undertake Captial and Structural Improvements to Achieve Disaster Mitigation

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL		COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	
PRIORITY 7 Page Street Flooding Alleviation @ St. Luke's Hospital Item 7	+	+	+	-	-	+	-	+	+	+	+	+	+	+	+	-	+	-	+	N	N	+	+	16	5	
PRIORITY 8 ButtonwoodPark Pond & Dam Improvements Item 4	-	+	+	+	-	+	-	+	-	-	-	+	-	+	+	+	+	-	+	+	N	+	+	14	8	Downstream conveyance improvements will involve Town of Dartmouth
PRIORITY 9 Pearl Street Flooding Alleviation @ Railyard & Career Center Item 8	+	+	+	+	+	+	-	+	-	-	-	-	+	+	+	-	+	-	+	N	N	+	+	14	7	
PRIORITY 10 Brownell Ave & Hawthorne St Flooding Alleviation Item 5	-	+	+	+	-	+	-	+	-	-	-	+	-	-	+	-	+	-	+	+	N	+	+	12	10	Downstream conveyance improvements will involve Town of Dartmouth
PRIORITY 11 New Bedford Reservoir Dam Improvements @ Turner's Pond Item 12	-	+	+	+	-	-	-	-	+	-	+	+	-	-	+	-	-	-	+	+	N	+	+	11	11	Downstream conveyance improvements will involve Town of Dartmouth
PRIORITY 12 Establish "Micro-Grid" with City for Auxiliary Power Item 13	-	-	+	-	-	-	-	+	-	-	+	+	+	+	+	-	+	-	N	N	N	+	+	10	10	

STAPLEE Criteria Worksheet

For all criteria indicate:

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Undertake Captial and Structural Improvements to Achieve Disaster Mitigation

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL		COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	
PRIORITY 13 Route 18 & Wamsutta Avenue Flooding Alleviation Item 9	-	+	+	-	-	+	-	-	-	-	+	-	+	+	+	-	-	-	+	N	N	+	+	9	11	
PRIORITY 14 Un-named Stream Flooding Alleviation From Sheffield Street southerly to Stratford Street Item 10	-	+	+	-	-	-	-	-	+	-	-	+	+	-	+	-	+	-	+	N	N	+	+	9	11	Downstream conveyance improvements will involve Town of Dartmouth
PRIORITY 15 Railway Swale Flooding Alleviation from Tarkiln Hill Road to Nash Road Pond & Downstream Conveyance	-	+	-	-	-	-	-	-	+	-	-	-	+	-	+	-	+	-	+	N	N	+	+	7	13	
PRIORITY 16 West End CSO Separation Contract Phase IV	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	N	N	+	+	5	16	
PRIORITY 17 West End CSO Separation Contract Phase V	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	N	N	+	+	5	16	
PRIORITY 18 Assawompsett Dam & Downstream Conveyance Item 1	-	-	-	-	-	-	-	-	+	-	-	+	-	-	+	-	-	-	-	-	N	+	+	4	17	

STAPLEE Criteria Worksheet

For all criteria indicate:

+ for favorable

- for less favorable

"N" for not applicable

Improve Operations, Administration, & Enforcement Under Municipal Control
To Achieve Disaster Mitigation

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL		COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	
(1) Improve the Inter-Municipal Agreement with Taunton for Ownership, Maintenance and Contorl of the Assawompsett Dam	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	N	-	+	3	19	
(2) Improve Communications and Data Gathering for Maintenance of the Storm Water, Sewer, and Potable Water Systems	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	-	+	-	+	N	N	+	+	18	4	
(3) Implement a Snow Plowing Tracking System based on GPS and GIS	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	+	+	N	N	N	N	N	16	2	

STAPLEE Criteria Worksheet

For all criteria indicate: Integrate Disaster Mitigation into Ongoing Planning Efforts

+ for favorable
- for less favorable
"N" for not applicable

STAPLEE Criteria	S (Social)		T (Technical)			A (Administrative)			P (Political)			L (Legal)			E (Economic)				E (Environmental)					TOTAL		COMMENTS
Considerations → / Alternative Actions ↓	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-Term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance & Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contributes to Economic Goals	Outside Funding Requried	Effect on Land & Water	Effect on Endangered Species	Effect on HAZMAT Waste Sites	Consistent w/ Environmental Goals	Consistent w/ Federal Laws	PLUS	MINUS	
(1) Incorporate Disaster Mitigation Plan Capital and O&M Projects into City Long Term CSO Control Plan & Capital Improvements Plan	-	+	+	+	-	-	-	-	-	+	+	+	+	-	+	-	+	-	+	N	N	+	+	12	9	

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